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THE UNIVERSITY OF ALBERTA

AN INVESTIGATION OF THE EXTENT TO WHICH
A STUDENT IN THE INTERMEDIATE SCHOOL APPLIES THE
GENERAL PRINCIPLES HE HAS STUDIED EARLIER TO THE
SOLVING OF NEW PROBLEMS

A DISSERTATION
SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
BACHELOR OF EDUCATION

COLLEGE OF EDUCATION

BY
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EDMONTON, ALBERTA
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"	2878	"	"	64
"	2638	"	"	65
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CHAPTER I

THE NATURE AND PURPOSE OF THE INVESTIGATION

The following investigation in General Science and Health Education is based on the Final Examinations conducted in June 1940. Every twentieth paper was selected from the four largest cities of Alberta, namely: Edmonton, Calgary, Lethbridge and Medicine Hat. This sample comprises one hundred fifty papers. Another sample of one hundred fifty papers was taken from the towns and leading villages, namely: Beverly, Big Valley, Blairmore, Camrose, Cardston, Coleman, Edson, Grande Prairie, Hanna, High River, Lacombe, Macleod, Magrath, Ponoka, Raymond, Redcliffe, Stettler, Taber, Vegreville, Vermilion, etc. A third sample of one hundred fifty papers represents the rural school population of Alberta. These four hundred fifty Final Examination papers in General Science and Health Education were obtained from the High School Entrance Examination Board, the Department of Education.

The purpose of this investigation is to discover the extent to which a student in the Intermediate School applies the General Principles he has studied earlier to the solving of new problems.

The question arises: Are we, the teachers of this province, creating the right attitude towards problem solving; are we instructing in scientific investigation; or are we teaching simply a collection of scientific facts that are to be memorized by the students for the final examination in June? The following figures and graphs speak for themselves.

Further, the author has made a careful analysis of our modern textbooks and curricula in General Science for the Intermediate School grades.

The introduction to General Science in our Programme of Studies reads as follows:

The process of thinking from facts to the solution of a problem is the scientific method. Techniques are but superficial aspects of education. Nevertheless, it is desirable that certain procedures become habitual to the students. The following steps of an experiment, from Useful Science, are reproduced with the permission of the publishers, The John C. Winston Co.:

1. Question or Problem: The question that we are asking nature. What we wish to find out.
2. Materials: The things needed to make the experiment.
3. Manipulation or Method: What we shall have to do with the materials to find the answer to the question.
4. Observation: What happens as a result of what was done.
5. Diagram or Sketch: A neat, simple drawing showing the method used to solve the problem.
6. Conclusion: The answer to the question. What our method and our observations have shown us to be true.
7. Practical Application: Most of our experiments will have a direct application to everyday life. These applications in many cases we can see for ourselves; in other cases, we need to have them explained.

Our environment is of two kinds: fixed and changing. The Laws in science are relatively fixed and should be learned as quickly and completely as possible. In order to interpret our changing environment, students must be prepared to think, and be able to find the most recent facts on which to base their thinking. They should be able to recognize certain integrating themes: as space, time, change, adaptation, interrelationships, and variety. Around such themes as these, teachers must correlate the various fields of the special sciences, under the heading "General Science".

Dr. Thomas Briggs states that the method of approach in General Science may well be through the avenue of questioning, or "naive questions":

1. "What is it?"
Satisfies curiosity and leads to more significant questions.
2. "What is it for?"
General Science should not only answer this question, but extend it beyond what the student without direction could possibly perceive.
3. "How does it work?"
Satisfies and extends curiosity so that a desire and need are felt for something more.

4. "Can I work it?"

Psychology has taught us to recognize the satisfaction that comes from activity and from feeling oneself a cause.

5. "What causes it to work?"

Principles should grow out of acquaintance with phenomena. Numerous applications should stamp them into memory and insure wide usefulness.

6. "What further application has this principle than is now known?"

This leads to invention. Such a question is asked only by advanced thinkers.

While learning is unitary, for purposes of clarifying thought we may analyse it into the kinds of changes in students which may be stimulated through science teaching; such as the following:

1. Forming and understanding concepts; as, -

"Most substances change state by absorbing or releasing energy."

- a. Concepts should be achieved through a rich experience with natural phenomena which may contribute to them.
- b. Experiences should be so motivated that ideas resulting therefrom are continually associated into broader and more meaningful relationships.

2. Development of careful and critical methods of thinking. There are at least six habits which characterize such thinking. They are the following:

- a. Habit of accuracy in all operations, including calculation, observation, and report.
- b. Habit of intellectual honesty. This is the habit of sticking to the facts and admitting error when proved.
- c. Habit of open-mindedness. This means a willingness to consider new facts.
- d. Habit of criticism, including self-criticism.
- e. Habit of looking for true cause-and-effect relationships. Here the prevalent superstitions are subjected to searching analysis.
- f. Habit of suspended judgment. This is looking for all pertinent data before making a decision.

3. Changes in overt behavior.

- a. Science education should replace action based on fear of natural processes with action based on understanding.
- b. Care of trees, forests and grasslands should be promoted by understanding of the balance of nature and the consequences of disturbing that balance.

These are but two of the many desirable changes in behavior that science education can promote.

4. Development of specific attitudes, interests and appreciations. Those which are most valuable will grow only when the teacher plans consciously for their development.

5. Development of an adequate and intelligent philosophy of life. In past times the idea of a flat earth was satisfactory. Later the idea of a spherical earth was needed. Today we must have an idea of a vast universe in order to have an adequate frame of reference for our thinking.

The teacher's function is to plan and direct rich experiences for his students. Through these he may influence the forming of concepts, the thinking that is done, the changes in behavior, the attitudes and appreciations developed, and the modifications in the student's philosophy of life.

This course should not develop in to note-giving course. The revising committee would discourage the use of manuals, helps, etc., in the hands of the students. Pupil growth through teacher growth is an ideal at which we must aim. Pupils should be encouraged to take inventory of the work accomplished, and set down in sentence form the outstanding fundamental facts deduced from observation, experimentation, and reading. Well planned laboratory work, properly organized field trips, the use of library facilities, and open forum discussions are of far greater importance in the presentation of General Science than are lectures and demonstrations by the teacher.

No textbook has been authorized for the use of Grade IX students. However, the teachers may recommend that their students purchase one of the following books for use as a textbook:

1. Understanding Our Universe (Interpreting Science Series, Book III): Franklin B Carroll.
2. Our Environment - How We Use and Control It, Book III: Carpenter and Wood.
3. Everyday Problems in Science: Pieper and Beauchamp.
4. Book of General Science: Hilton.

The following books are recommended as reference books for the use of pupils:

1. Science (The Story of Progress and Discovery): Davis and Sharpe.
2. Science Problems, Book 3: Beauchamp, Mayfield and West.
3. The March of Science, Book III: Hunter and Whitman.
4. Man's Control of His Environment, Book III: Powers, Neuner and Bruner.
5. Science in Our World of Progress, Book III: Hunter and Whitman.
6. Useful Science for High School: Weed, Rexford and Carroll.
7. Science Indoors and Out, Book III: Hensley and Patterson.
8. General Science for Today: Watkins and Bedell.
9. Conquering the World of Science: Nida.
10. The Science of Everyday Life: Vanbuskirk and Smith.
11. Living in a World of Science, Books I and II: Meister.
12. Science: Hunt, Clark and Davidson.
13. Science Experiments with Home Equipment: Lynde.
14. Science Experiments with Inexpensive Equipment: Lynde.

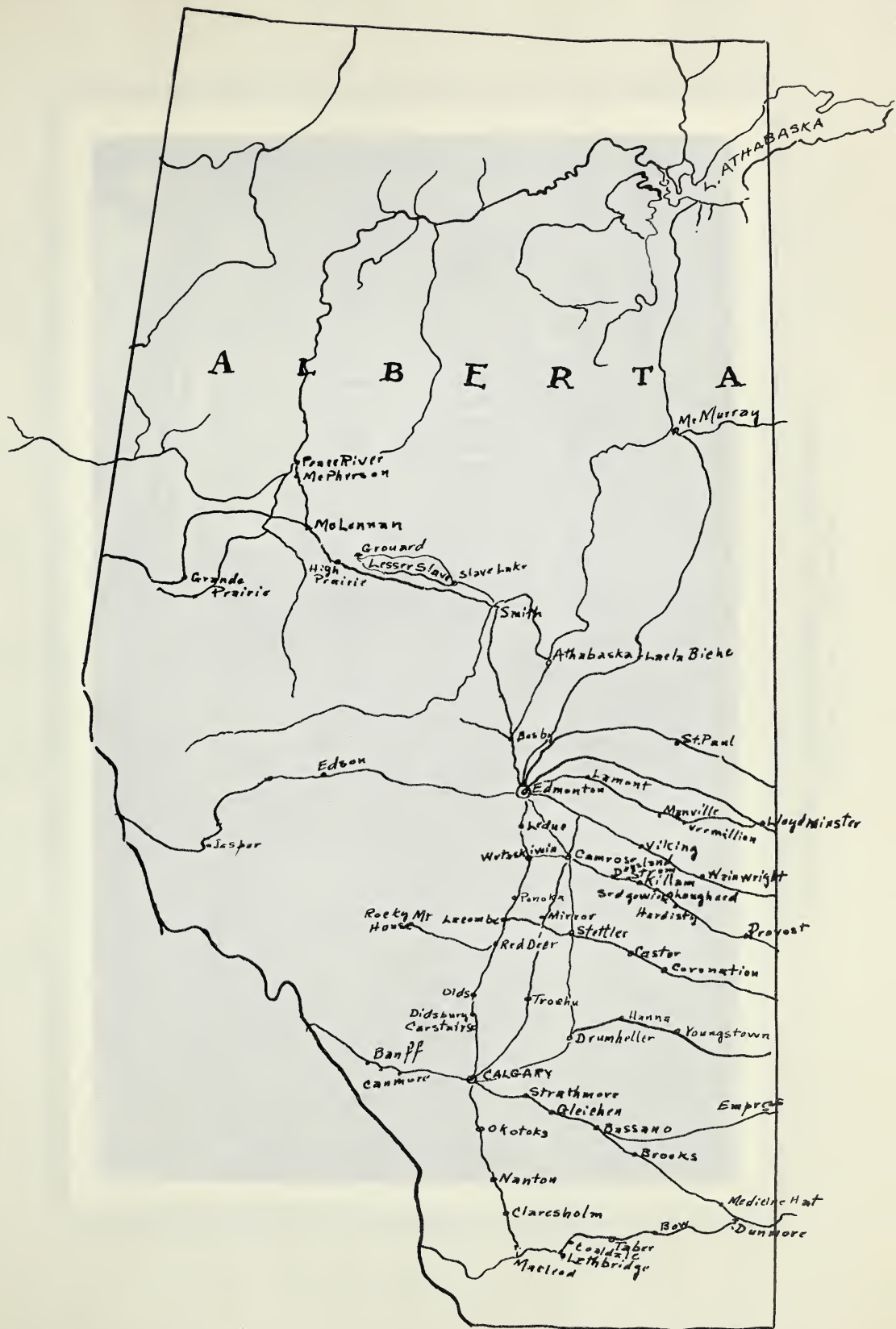


Figure 1. Main examination centres.



McCAULEY INTERMEDIATE SCHOOL
Edmonton, Alberta.

TABLE I
DEPARTMENTAL EXAMINATIONS, 1940

TIME - TABLE		
DATE	GRADE IX	GRADE XII
WEDNESDAY, June 19th		Survey Test (2:00-5:00)
THURSDAY, June 20th		General Test (9:00-10:00) Reading the Regulations (1:45-2:00) English 3 - Part 1 B (Literature) (2:00-5:00)
FRIDAY, June 21st		Chemistry 2 (9:00-11:30) Trigonometry and Analytical Geometry (2:00-5:00)
MONDAY, June 24th	Reading the Regulations (8:45-9:00) English - Part II (Language) (9:00-11:00)	Algebra 2 (9:00-12:00) English 3 - Part II (Language) (2:00-5:00)
TUESDAY, June 25th	General Test (9:00-9:45) English - Part I (Literature) (10:00-11:00)	Physics 2 (9:00-11:30) German 3 (2:00-5:00)
WEDNESDAY, June 26th	General Science and Health Education (9:00-11:30)	Social Studies 3 (9:00-12:00) Latin 3 (2:00-5:00)
THURSDAY, June 27th	Mathematics - Part I (Algebra) (9:00-10:30) Mathematics - Part II (Geometry) (2:00-3:30)	Biology 2 (9:00-11:30) History of English Literature I (2:00-4:30)
FRIDAY, June 28th	Social Studies (9:00-11:30)	French 3 (9:00-12:00)

The examination in General Science and Health Education was given on Wednesday, June 26th, between the hours nine and eleven thirty, as the above table indicates.

At the conclusion of the examinations, all the candidates' papers from the different schools of the Province are forwarded to the Edmonton Normal School where the Department of Education has them read. The examiners are a number of selected teachers from all parts of the Province who are familiar with the particular subject they are to mark.

Before the envelopes are passed on to the examiners to be opened and read, the name slip on each envelope is removed and the candidate is given a number. This number is stamped on all the envelopes that the candidate has handed to the presiding examiner. To the reading examiner, the candidate is known only by the number on the envelope.

The author is an instructor of General Science at the McCauley Intermediate School, Edmonton, and was one of a group of thirty-six examiners in General Science and Health Education at the Edmonton Normal School in July 1940.

The expression Towns, also Towns and Villages shall mean Town and Village Districts. The word Cities shall mean City Districts, and Rural shall mean Rural Districts.

The three following tables list the numbers which appear on the papers that were selected for this investigation. Each table shows the numbers of one hundred fifty papers that constitute the sample for one group of the investigation.

TABLE II

The following are the candidates' numbers which appear on the examination papers. It will be noticed that every twentieth paper was selected.

Towns and Villages (150 papers).

1	1797	3817	4416	5355
20	1816	3837	4436	5375
40	1836	3857	4456	5395
60	1856	3877	4476	5415
80	1876	3897	4706	5435
100	1896	3917	4726	5455
120	1916	3937	4746	5475
140	1936	3957	4766	5495
159	1956	3977	4786	5515
180	1976	3997	4806	5535
200	1996	4017	4826	5555
220	2016	4037	4845	5576
240	2036	4057	4995	5596
260	2056	4077	5015	5616
280	2076	4097	5035	5636
300	2096	4117	5055	5656
320	2116	4137	5075	5676
340	2136	4157	5095	5696
440	2156	4177	5115	5716
460	2176	4197	5135	5736
480	2196	4216	5155	5756
500	2216	4236	5175	5776
1637	2236	4256	5195	5796
1657	2256	4276	5215	5816
1677	2276	4296	5235	5836
1697	2296	4316	5255	5856
1717	2316	4336	5275	5867
1737	3757	4356	5295	5896
1757	3777	4376	5315	5916
1777	3797	4396	5335	5936

TABLE III

Candidates' numbers on the examination papers of the four leading cities of Alberta: Edmonton, Calgary, Lethbridge and Medicine Hat. (150 papers). Again every twentieth paper was selected.

511	1111	2379	2958	3558
531	1131	2399	2978	3578
551	1151	2418	2998	3598
571	1171	2419	3018	3618
591	1191	2438	3038	3638
611	1211	2458	3058	3658
631	1231	2478	3078	3678
651	1251	2498	3098	3698
671	1271	2518	3118	3718
691	1291	2538	3158	3738
711	1311	2558	3158	3758
731	1331	2578	3178	4489
751	1351	2598	3198	4509
771	1371	2618	3218	4529
791	1391	2638	3238	4549
811	1411	2658	3258	4569
831	1431	2678	3278	4589
851	1451	2698	3298	4609
871	1471	2718	3318	4629
891	1491	2738	3338	4649
911	1511	2758	3358	4669
931	1531	2778	3378	4689
951	1551	2798	3398	4846
971	1571	2818	3418	4866
991	1591	2838	3438	4886
1011	1611	2858	3458	4906
1031	1631	2878	3478	4926
1051	1651	2898	3498	4946
1071	2319	2918	3518	4966
1091	2339	2938	3538	4986
	2359			

TABLE IV

Rural candidates' numbers of the entire Province of Alberta.

Every twentieth paper was selected (150 papers).

6661	7261	7861	8461	9040
6681	7281	7881	8481	9060
6701	7301	7901	8501	9080
6721	7321	7921	8521	9100
6741	7341	7941	8541	9120
6761	7361	7961	8561	9140
6781	7381	7981	8581	9160
6801	7401	8001	8601	9180
6821	7421	8021	8621	9200
6841	7441	8041	8641	9220
6861	7461	8061	8661	9240
6881	7481	8081	8681	9260
6901	7501	8101	8701	9280
6921	7521	8121	8721	9300
6941	7541	8141	8741	9320
6961	7561	8161	8761	9340
6981	7581	8181	8781	9360
7001	7601	8201	8800	9380
7021	7621	8221	8801	9400
7041	7641	8241	8820	9420
7061	7661	8261	8840	9440
7081	7681	8281	8860	9460
7101	7701	8301	8880	9480
7121	7721	8321	8900	9500
7141	7741	8341	8920	9520
7161	7761	8361	8940	9540
7181	7781	8381	8960	9560
7201	7801	8401	8980	9580
7221	7821	8421	9000	9600
7241	7841	8441	9020	9620

CHAPTER II

GENERAL SURVEY OF THE INVESTIGATION

Percentile Rank, Median Score, and Standard Deviation.---

Tables V to XIV show the Percentile Rank of each candidate, the score for each part of the student's paper, his total score, the deductions for misspelled words (ten being the limit), and the net total score. The total possible score is 190.

Table XV shows the frequencies of the students for certain percentile ranks in each of the four cities, in all of the city districts, in all the town and village districts, in all the rural districts, and finally the grand total.

It will be noticed that in the city districts more students have a high percentile rank than a low one; while in the rural districts, more students have a low rank. The trend for the town and village districts' curve is half way between the other two, as figure 3 indicates.

Tables XVI, XVII and XVIII show the frequencies of the students for the different scores, and the MEDIAN SCORES for the city, town, and rural districts. The MEDIAN SCORE for the city districts is 96.28; for the town and village districts, it is 84.82; and for the rural districts, it is 75.36. The MEDIAN SCORE for the town and village districts is 9.5 points higher than that for the rural districts; while the MEDIAN SCORE for the city districts is 11.5 points above that of the town and village districts.

Table XIX gives 85.7 as the MEDIAN SCORE for the whole province. It will be noticed that this provincial median score almost corresponds with that of the town and village districts.

Table XX gives us the STANDARD DEVIATION for the Province. Sigma (σ) is 22.1 scale units. Since the curve is symmetrical, the Mean and Median would be the same; then two thirds of the students obtained scores between 63.6 ($85.7 - 22.1$) and 107.8 ($85.7 + 22.1$). One sixth of the students have scores above 107.8; while the other sixth of the students have scores between 63.6 and 30. The upper limit is 150.

TABLE V

CITY OF EDMONTON

Percentile Rank	Candidate's Number	Score			Total	Less Spell	Net Total
		Part 1	Part 2	Part 3			
57	2319	16	5	61	82	9	73
57	2339	14	5	74	93	1	92
25	2359	25	1	40	66	4	62
44	2379	21	17	52	90	4	86
62	2399	16	6	71	93	8	85
25	2418	23	5	42	70	1	69
65	2419	20	4	60	84	1	83
25	2438	17	7	48	72	5	67
52	2458	20	5	47	72	1	71
9	2478	20	5	39	64	7	57
83	2498	26	3	104	133	7	126
57	2518	22	8	56	86	5	81
37	2538	16	10	95	121	10	111
74	2558	23	6	91	120	2	118
77	2578	25	9	56	90	1	89
68	2598	23	10	91	124	10	114
85	2618	23	2	82	107	2	105
78	2638	23	9	49	81	4	77
74	2658	27	9	93	129	10	119
27	2678	19	5	62	86	10	76
92	2698	21	4	75	100	0	100
33	2718	25	6	81	112	1	111
81	2738	20	6	82	108	5	103
68	2758	26	5	66	97	4	93
81	2778	20	7	79	106	10	96
33	2798	16	7	79	102	6	96
20	2818	24	5	60	89	8	81
48	2838	21	3	79	103	3	100
81	2858	23	7	87	117	2	115
71	2878	18	3	93	114	2	112
74	2898	22	6	69	97	3	94
65	2918	9	0	88	97	1	96
37	2938	24	10	60	94	5	89
15	2958	20	0	41	61	2	59
20	2978	18	10	69	97	3	94
78	2998	21	4	86	111	4	107
15	3018	20	3	33	56	1	55

TABLE VI

CITY OF EDMONTON (Continued)

Percentile Rank	Candidate's Number	Score				Less Spell	Net Total
		Part 1	Part 2	Part 3	Total		
9	3038	20	3	45	68	4	64
5	3058	24	5	43	72	1	71
12	3078	17	1	33	51	0	51
71	3098	28	5	73	106	3	103
22	3118	20	4	43	70	2	65
74	3138	28	8	69	105	0	105
37	3158	24	6	84	114	3	111
98	3178	25	5	100	130	2	128
9	3198	25	6	49	80	2	78
71	3218	26	5	58	89	3	86
78	3238	25	6	69	100	2	98
44	3258	25	5	85	115	6	109
12	3278	19	10	46	75	10	65
57	3298	24	0	65	89	4	85
85	3318	23	10	99	132	5	127
52	3338	21	6	58	85	0	85
92	3358	25	9	53	87	2	85
62	3378	24	6	71	101	2	99
55	3398	21	5	42	68	1	67
99	3418	22	6	105	133	3	130
55	3438	23	5	56	84	2	82
100	3458	28	7	113	148	0	148
68	3478	27	6	64	97	4	93
15	3498	20	6	58	84	3	81
81	3518	17	6	79	102	1	101
94	3538	28	10	57	95	0	95
41	3558	21	3	54	78	10	68
12	3578	19	7	69	95	8	87
85	3598	28	8	85	121	10	111
1	3618	15	5	22	42	3	39
41	3638	20	1	65	86	0	86
25	3658	20	1	72	93	3	90
97	3678	27	7	102	136	6	130
74	3698	24	14	85	123	4	119
81	3718	25	7	72	104	5	99
41	3738	25	5	53	84	6	78
37	3756	23	5	74	102	5	97

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TABLE VII
CITY OF CALGARY

Percentile Rank	Candidate's Number	Score				Less Spell	Net Total
		Part 1	Part 2	Part 3	Total		
17	511	18	9	67	94	10	84
52	531	19	11	73	103	10	93
88	551	26	9	80	115	4	111
96	571	30	11	74	115	2	113
62	591	28	12	62	102	5	97
81	611	28	10	90	128	5	123
78	631	26	17	100	143	2	141
89	651	30	3	88	121	0	121
62	671	15	1	61	77	3	74
62	691	27	17	65	109	0	109
62	711	30	7	55	92	3	89
48	731	24	11	77	106	5	101
37	751	21	6	78	105	10	95
48	771	18	9	66	93	2	91
83	791	29	16	98	143	3	140
30	811	27	8	59	94	1	93
92	831	26	15	92	133	8	125
41	851	19	4	94	117	2	115
55	871	26	3	66	95	3	92
57	891	30	11	58	99	0	99
62	911	18	6	72	96	6	90
12	931	25	9	58	92	1	91
55	951	24	7	79	110	6	104
41	971	24	6	83	113	6	107
17	991	24	2	51	77	6	71
48	1011	18	3	54	75	2	73
89	1031	27	6	102	135	1	134
57	1051	22	10	98	130	9	121
55	1071	25	5	80	110	6	104
78	1091	21	10	101	132	3	129
99	1111	22	17	111	152	2	148
92	1131	28	13	97	138	1	137
85	1151	20	9	78	107	9	98
74	1171	27	12	80	119	5	114
55	1191	22	8	75	105	2	103
65	1211	23	5	53	81	2	79
3	1231	18	4	36	58	2	56
99	1251	26	7	92	125	8	117
62	1271	21	5	65	91	1	90
99	1291	27	12	82	121	3	118
57	1311	30	13	65	108	8	100
44	1331	18	7	77	102	1	101
48	1351	20	9	91	120	2	118
88	1371	28	13	72	113	1	112
22	1391	18	5	54	77	6	71
3	1411	16	2	67	85	10	75
22	1431	20	8	72	100	6	94
5	1451	20	7	34	61	5	56
44	1471	23	8	62	93	2	91
30	1491	21	4	50	75	0	75

TABLE VIII

CITY OF CALGARY (Continued)

Percentile Rank	Candidate's Number	Score			Total	Less Spell	Net Total
		Part 1	Part 2	Part 3			
30	1511	20	2	58	80	2	78
44	1531	24	7	64	95	0	95
99	1551	29	7	84	120	3	117
71	1571	21	6	59	86	4	82
98	1591	32	18	94	144	5	139
85	1611	20	1	57	78	1	77
44	1631	16	3	56	75	0	75

CITY OF LETHBRIDGE

48	4489	24	12	78	114	3	111
8	4509	27	9	66	102	5	97
62	4529	24	5	64	93	0	93
44	4549	25	10	82	117	1	116
81	4569	18	11	97	126	10	116
17	4589	23	6	66	95	7	88
17	4609	16	5	57	78	1	77
81	4629	27	14	80	121	1	120
12	4649	25	10	63	98	4	94
41	4669	16	8	53	77	1	76
44	4689	25	12	89	126	10	116

CITY OF MEDICINE HAT

71	4846	20	12	64	96	1	95
68	4866	27	4	68	99	0	99
25	4886	26	7	86	119	10	109
62	4906	24	7	72	103	2	101
44	4926	22	6	93	121	4	117
30	4946	21	3	83	107	4	103
52	4966	15	8	67	90	0	90
71	4986	18	4	71	93	0	93

TABLE IX

TOWNS and VILLAGES

Percentile Rank	Candidate's Number	Score				Less Spell	Net Total
		Part 1	Part 2	Part 3	Total		
78	1	20	6	57	83	1	82
25	20	13	7	41	61	2	59
15	40	16	7	39	62	2	60
65	60	22	11	67	100	10	90
74	80	20	8	90	118	9	109
41	100	31	8	57	96	4	92
17	120	26	10	54	90	5	85
17	140	10	8	65	83	4	79
57	159	22	4	72	98	10	88
99	180	23	7	95	125	5	120
83	200	21	6	82	109	3	106
78	220	21	3	60	84	4	80
81	240	31	11	87	129	10	119
20	260	24	8	56	88	1	87
12	280	25	5	70	100	9	91
20	300	22	3	58	83	9	74
68	320	21	3	64	88	5	83
81	340	24	7	75	106	3	103
97	440	27	6	78	111	1	110
48	460	28	10	90	128	8	120
3	480	17	3	67	87	9	78
17	500	16	3	34	53	10	43
88	1637	19	9	79	107	3	104
15	1657	20	5	59	84	3	81
68	1677	22	4	62	88	8	80
30	1697	28	6	64	98	3	95
41	1717	27	13	46	86	1	85
22	1737	15	3	37	55	4	51
41	1757	18	6	47	71	2	69
15	1777	16	2	44	62	6	56
17	1797	21	5	53	79	9	70
9	1816	19	3	36	58	1	57
81	1836	18	13	73	104	4	100
65	1856	23	5	70	98	1	97
22	1876	13	3	44	60	0	60
33	1896	18	15	55	78	0	78
12	1916	20	2	63	85	10	75
41	1936	21	10	91	122	1	121
81	1956	20	12	52	84	0	84
15	1976	24	5	69	98	3	95
81	1996	26	7	65	98	1	97
30	2016	21	7	66	94	10	84
89	2036	27	5	73	105	3	102
89	2056	19	12	99	130	0	130
44	2076	14	7	81	102	10	92
81	2096	29	7	71	107	1	106
83	2116	25	7	74	106	0	106
74	2136	28	2	76	106	2	104
92	2156	33	18	101	152	4	148
41	2176	23	3	68	94	7	87

TABLE X

TOWNS and VILLAGES
(Continued)

Percentile Rank	Candidate's Number	Score			Total	Less Spell	Net Total
		Part 1	Part 2	Part 3			
65	2196	25	6	70	101	0	101
33	2216	25	4	59	88	5	83
55	2236	27	9	78	114	1	113
20	2256	21	10	58	89	4	85
83	2276	27	3	72	102	0	102
83	2296	24	5	68	97	10	87
22	2316	21	1	59	84	3	81
62	3757	25	11	73	109	1	108
37	3777	21	7	59	87	1	86
99	3797	29	13	74	116	3	113
1	3817	14	4	46	64	5	59
41	3837	17	4	54	75	6	69
12	3857	24	4	45	73	2	71
68	3877	22	5	61	88	10	78
52	3897	24	1	68	93	3	90
55	3917	19	7	58	84	2	82
20	3937	16	8	55	79	4	75
62	3957	23	8	57	88	6	82
30	3977	20	0	81	101	8	93
57	3997	27	13	52	92	1	91
65	4017	23	8	70	101	4	97
37	4037	27	8	61	96	1	95
68	4057	20	2	67	89	6	83
44	4077	13	7	55	75	2	73
78	4097	24	10	79	113	1	112
37	4116	19	8	34	61	2	59
62	4137	31	15	88	134	3	131
12	4157	22	5	36	63	1	62
68	4177	22	7	77	106	0	106
57	4197	28	9	50	87	3	84
2	4216	14	4	52	70	9	61
37	4236	16	4	68	88	3	85
30	4256	19	0	46	65	0	65
65	4276	28	4	78	110	4	106
83	4296	24	2	74	100	1	99
85	4316	19	10	61	90	0	90
68	4336	14	4	68	86	10	76
77	4356	22	2	49	73	0	73
85	4376	16	5	41	62	1	61
25	4396	17	3	55	75	1	74
52	4416	21	4	46	71	1	70
98	4436	30	7	107	144	1	143
37	4456	13	3	58	74	4	70
20	4476	17	7	37	61	2	59
3	4706	21	1	48	70	2	68
37	4726	24	3	75	102	4	98
100	4746	29	7	97	133	2	131
62	4766	17	8	65	90	2	88
37	4786	23	9	71	103	10	93
55	4806	24	6	75	105	1	104

TABLE XI

TOWNS and VILLAGES
(Continued)

Percentile Rank	Candidate's Number	Score Part 1	Score Part 2	Score Part 3	Total	Less Spell	Net Total
25	4826	15	5	43	63	7	56
12	4845	26	8	56	90	1	89
3	4995	13	1	27	41	2	39
52	5015	16	3	66	85	1	84
62	5035	29	7	75	111	2	109
25	5055	22	7	58	87	10	77
81	5075	19	8	78	105	5	100
48	5095	16	7	33	56	2	54
62	5115	18	7	53	78	0	78
52	5135	16	4	37	57	1	56
71	5155	25	9	95	129	1	128
81	5175	27	7	73	107	0	107
25	5195	25	6	58	89	10	79
12	5215	21	4	50	75	2	73
71	5235	21	12	53	86	0	86
89	5255	19	5	96	120	3	117
94	5275	20	9	67	96	3	93
8	5295	21	13	63	97	1	96
30	5315	19	9	48	76	2	74
48	5335	21	6	61	91	0	91
17	5355	21	6	33	60	5	55
88	5375	23	8	65	96	1	95
30	5395	20	7	49	76	2	74
8	5415	21	9	38	68	2	66
74	5435	18	7	88	113	5	108
30	5455	19	1	82	102	0	102
4	5475	18	4	38	60	4	56
88	5495	23	11	82	116	0	116
20	5515	19	2	39	60	1	59
17	5535	20	0	55	75	6	69
12	5555	17	8	51	76	10	66
6	5576	20	3	49	72	1	71
55	5596	16	1	62	79	4	75
96	5616	25	5	94	124	5	119
57	5636	22	2	83	107	10	97
1	5656	13	6	34	53	1	52
62	5676	15	1	72	88	5	83
9	5696	14	3	41	58	5	53
71	5716	20	2	56	78	4	74
41	5736	25	6	54	85	6	79
62	5756	29	3	42	74	1	73
30	5776	15	5	63	83	5	78
20	5796	18	7	63	88	2	86
6	5816	17	1	28	46	0	46
57	5836	19	6	62	87	1	86
12	5856	13	1	29	43	0	43
92	5876	27	6	78	111	4	107
3	5896	23	6	33	62	4	58
30	5916	19	7	41	67	1	66
88	5936	19	5	60	84	6	78

TABLE XII

RURAL DISTRICTS OF ALBERTA

Percentile Rank	Candidate's Number	Score				Less Spell	Net Total
		Part 1	Part 2	Part 3	Total		
5	6661	17	1	22	40	0	40
15	6681	13	10	40	63	10	53
88	6701	14	5	56	75	4	71
97	6721	31	3	77	111	3	108
12	6741	18	11	41	70	4	66
25	6761	18	5	48	71	5	66
3	6781	24	5	58	87	6	81
62	6801	22	4	59	85	3	82
62	6821	22	8	54	84	6	78
15	6841	18	7	35	60	9	51
74	6861	23	8	51	82	3	79
74	6881	24	9	80	113	5	108
44	6901	23	7	58	88	0	88
12	6921	14	3	43	60	2	58
33	6941	17	4	59	80	10	70
37	6961	23	7	72	102	1	101
71	6981	24	8	60	92	5	87
8	7001	20	5	42	67	4	63
71	7021	17	6	62	85	10	75
30	7041	14	5	44	63	3	60
55	7061	19	5	63	87	2	85
96	7081	28	9	78	115	5	110
31	7101	17	5	31	53	2	51
33	7121	33	13	72	118	6	112
5	7141	25	8	54	87	3	84
96	7161	24	7	53	84	8	76
92	7181	28	5	75	108	3	105
41	7201	22	6	58	86	8	78
41	7221	19	6	45	70	0	70
33	7241	23	6	69	98	7	91
15	7261	18	3	57	78	6	72
44	7281	19	7	61	87	10	77
25	7301	19	2	39	60	1	59
20	7321	16	3	44	63	6	57
62	7341	19	2	48	69	1	68
55	7361	19	12	62	93	7	86
2	7381	15	1	24	40	0	40
25	7401	20	5	52	77	6	71
12	7421	22	5	45	72	3	69
27	7441	31	6	65	102	3	99
9	7461	19	4	41	64	2	62
44	7481	27	15	72	114	3	111
74	7501	23	10	64	97	8	89
44	7521	19	10	41	70	1	69
17	7541	25	3	60	88	2	86
17	7561	23	9	36	68	2	66
74	7581	27	11	68	106	10	96
52	7601	17	3	39	59	0	59
6	7621	20	3	43	66	2	64
85	7641	18	9	59	86	3	83

TABLE XIII

RURAL DISTRICTS OF ALBERTA
(Continued)

Percentile Rank	Candidate's Number	Score				Total	Less Spell	Net Total
		Part 1	Part 2	Part 3				
5	7661	19	6	58		83	10	73
74	7681	19	5	39		63	3	60
44	7701	24	2	46		72	3	69
48	7721	20	10	57		87	4	83
12	7741	12	0	29		41	1	40
41	7761	21	5	63		89	1	88
65	7781	19	9	60		88	0	88
48	7801	27	5	61		93	3	90
5	7821	15	5	44		64	2	62
65	7841	12	5	53		70	2	68
20	7861	15	3	49		67	0	67
6	7881	21	0	32		53	0	53
30	7901	16	11	59		86	5	81
25	7921	25	3	56		84	7	77
85	7941	23	15	61		99	1	98
4	7961	14	3	40		57	2	55
55	7981	22	4	80		106	6	100
33	8001	14	9	44		67	5	62
15	8021	16	7	43		66	3	63
85	8041	20	4	66		90	2	88
88	8061	23	1	35		59	0	59
85	8081	17	6	54		77	1	76
52	8101	21	5	43		69	3	66
74	8121	18	5	37		60	0	60
25	8141	25	6	69		100	0	100
37	8161	26	7	52		85	2	83
57	8181	23	1	47		71	4	67
65	8201	14	6	59		79	2	77
12	8221	15	5	55		75	3	72
37	8241	30	6	77		113	10	103
41	8261	19	4	39		62	4	58
9	8281	19	2	58		79	3	76
92	8301	21	14	71		106	1	105
9	8321	11	0	37		48	0	48
15	8341	17	5	64		86	0	86
48	8361	27	5	66		98	0	98
55	8381	26	7	62		95	8	87
37	8401	22	8	54		84	1	83
85	8421	23	1	56		80	2	78
62	8441	21	7	69		97	0	97
85	8461	22	10	72		104	0	104
12	8481	14	7	65		86	10	76
1	8501	6	1	27		34	0	34
8	8521	23	6	36		65	1	64
30	8541	22	5	64		91	1	90
1	8561	16	1	48		65	3	62
81	8581	27	7	64		98	2	96
89	8601	21	10	77		108	3	105
3	8621	19	6	48		73	4	69
37	8641	32	6	67		106	6	100

TABLE XIV

RURAL DISTRICTS OF ALBERTA
(Continued)

Percentile Rank	Candidate's Number	Score			Total	Less Spell	Net Total
		Part 1	Part 2	Part 3			
41	8661	23	5	42	70	0	70
3	8681	23	6	53	82	0	82
83	8701	24	10	66	100	0	100
81	8721	24	4	65	93	1	92
33	8741	14	4	50	68	0	68
81	8761	29	7	78	114	4	110
12	8781	9	0	25	34	0	34
20	8800	16	8	41	65	8	57
27	8801	19	6	37	62	1	61
33	8820	17	3	33	53	1	52
8	8840	16	7	44	67	0	67
9	8860	15	2	35	52	6	46
9	8880	17	3	22	42	6	36
100	8900	25	7	51	83	0	83
55	8920	27	12	68	107	8	99
27	8940	18	1	67	86	1	85
20	8960	15	5	63	83	6	77
20	8980	15	5	42	62	2	59
48	9000	21	2	35	58	0	58
62	9020	14	7	51	72	0	72
37	9040	26	4	54	84	0	84
48	9060	21	4	5	30	2	28
20	9080	25	5	45	75	8	67
44	9100	20	3	65	90	3	87
62	9120	20	7	57	84	0	84
1	9140	16	2	45	63	3	60
2	9160	7	5	52	64	1	63
20	9180	13	1	32	46	1	45
74	9200	20	11	61	92	0	92
9	9220	7	0	28	35	0	35
30	9240	19	6	47	72	2	70
33	9260	20	1	70	91	0	91
71	9280	21	10	81	112	2	110
37	9300	19	3	62	84	1	83
15	9320	18	0	46	64	3	61
92	9340	28	3	98	129	10	119
62	9360	19	3	64	86	10	76
57	9380	22	6	79	107	1	106
92	9400	26	9	56	91	1	90
12	9420	24	4	42	70	1	69
62	9440	24	3	83	110	4	106
48	9460	20	5	79	104	5	99
52	9480	21	4	56	81	4	77
22	9500	13	9	39	61	3	58
8	9520	13	4	46	63	1	62
57	9540	24	6	68	98	8	90
48	9560	21	5	49	75	5	70
74	9580	17	2	32	51	3	48
17	9600	17	6	49	72	2	70
30	9620	28	3	52	83	4	79

TABLE XV
FREQUENCY TABLE
of
PERCENTILE RANK

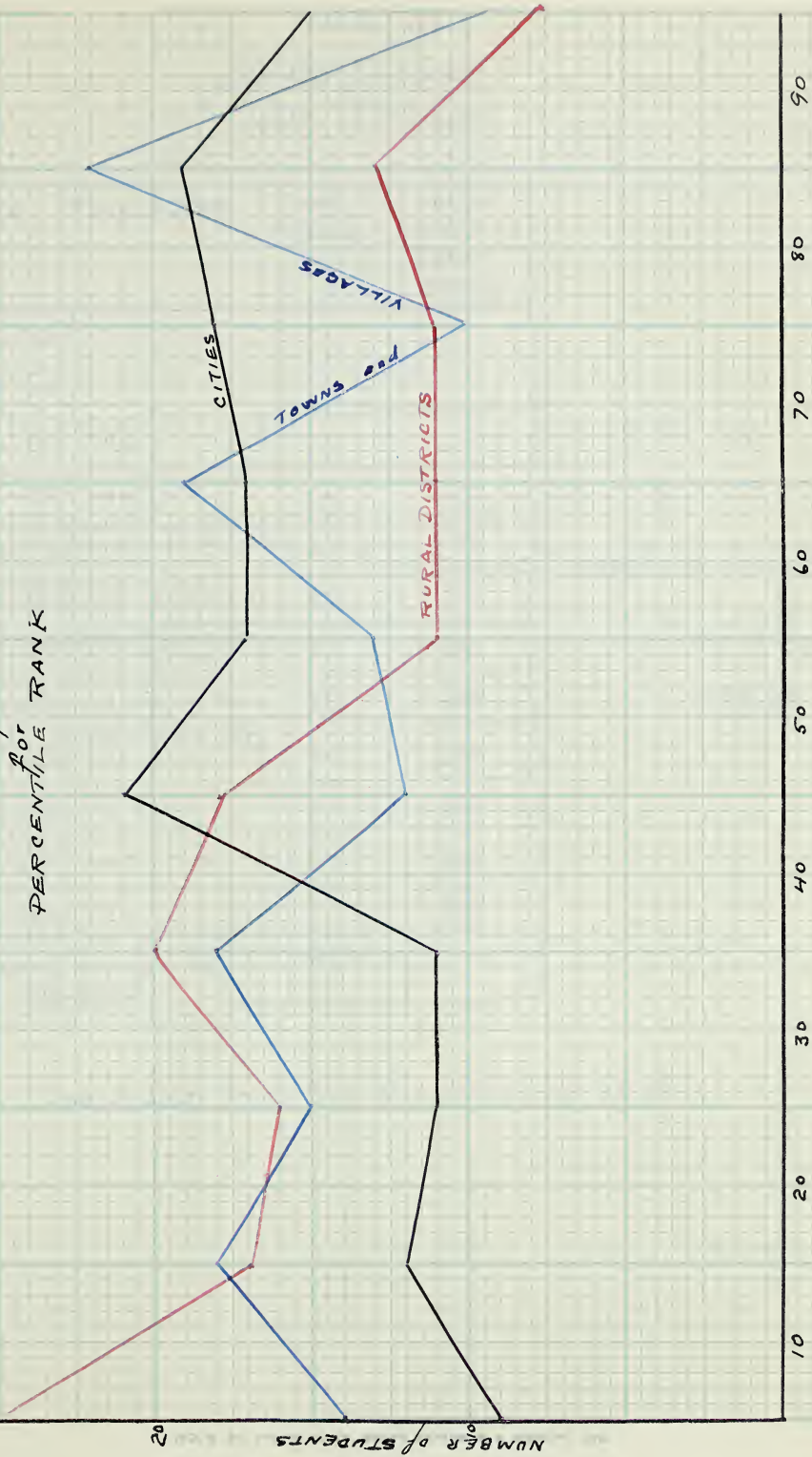
Percentile Rank	Edmon- ton.	Cal- gary.	Leth- bridge	Med. Hat.	Total Cities & Villages	Towns	Rural Dist.	Grand Total
1 - 9	5	3	1		9	14	25	48
10 - 19	6	3	3		12	18	17	47
20 - 29	8	2		1	11	15	16	42
30 - 39	6	4		1	11	18	20	49
40 - 49	6	10	4	1	21	12	18	51
50 - 59	8	8		1	17	13	11	41
60 - 69	7	7	1	2	17	19	11	47
70 - 79	12	4		2	18	10	11	39
80 - 89	9	8	2		19	22	13	54
90 - 100	7	8			15	9	8	32
Total	74	57	11	8	150	150	150	450

There are more students in the upper brackets in the Cities than the Towns and Villages.

In the Rural Districts there are more students in the lower brackets than the Towns and Villages.

These are definite trends as shown on the graph.

DISTRIBUTION OF STUDENTS
for
PERCENTILE RANK



PERCENTILE RANK

Figure 3.



TABLE XVI
FREQUENCY TABLE
for
CITY DISTRICTS

Score	Tabulation	Fre- quency	Accu- mulated Fre- quency
30 - 39	I	1	1
40 - 49			
50 - 59	IIII I	6	7
60 - 69	IIII III	8	15
70 - 79	IIII IIII IIII IIII	19	34
80 - 89	IIII IIII IIII IIII	19	53
90 - 99	IIII IIII IIII IIII IIII IIII IIII	35	88
100 -109	IIII IIII IIII IIII	20	108
110 -119	IIII IIII IIII IIII IIII	24	132
120 -129	IIII IIII	9	141
130 -139	IIII	5	146
140 -149	IIII	4	150
Total number of Students		150	

$$N = 150$$

$$\frac{N}{2} = 75$$

$$\text{Median} = 90 + \frac{22 \times 10}{35}$$

$$= 90 + 6.28$$

$$= 96.28$$

The Median Score for the Cities is 96.28.

TABLE XVII
FREQUENCY TABLE
for
TOWNS and VILLAGES
in
GENERAL SCIENCE and HEALTH EDUCATION

Score	Tabulation	Fre- quen- cy.	Accu- mulated fre- quency.
30 - 39	/ .	1	1
40 - 49	///	3	4
50 - 59	HHH HHH HHH I	16	20
60 - 69	HH HHH ///	13	33
70 - 79	HHH HHH HHH HHH HHH ///	28	61
80 - 89	HHH HHH HHH HHH HHH ///	29	90
90 - 99	HHH HHH HHH HHH //	22	112
100 -109	HHH HHH HHH HHH I	21	133
110 -119	HHH ///	8	141
120 -129	////	4	145
130 -139	///	3	148
140 -149	//	2	150
Total number of Students		150	

$$N = 150$$

$$\frac{N}{2} = 75$$

$$\text{Median} = 80 + \frac{14 \times 10}{29}$$

$$= 80 + 4.82$$

$$= 84.82$$

The Median Score for the Towns and Villages is 84.82.

TABLE XVIII
FREQUENCY TABLE
for
RURAL DISTRICTS of ALBERTA
in
GENERAL SCIENCE and HEALTH EDUCATION

Score	Tabulation	fre- quen- cy.	Accu- mulated fre- quency
20 - 29	I	1	1
30 - 39	IIII	4	5
40 - 49	IIII I	7	12
50 - 59	IIII IIII I	16	28
60 - 69	IIII IIII IIII I	32	60
70 - 79	IIII IIII IIII IIII I	28	88
80 - 89	IIII IIII IIII IIII I	26	114
90 - 99	IIII IIII IIII I	16	130
100 -109	IIII IIII IIII I	14	144
110 -119	IIII I	6	150
120 -129			
130 -139			
140 -149			
Total number of Students.		150	

$$N = 150$$

$$\frac{N}{2} = 75$$

$$\text{Median} = 70 + \frac{15 \times 10}{28}$$

$$= 70 + 5.36$$

$$= 75.36$$

The Median Score for the Rural Districts is 75.36.

Fig.4 FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES

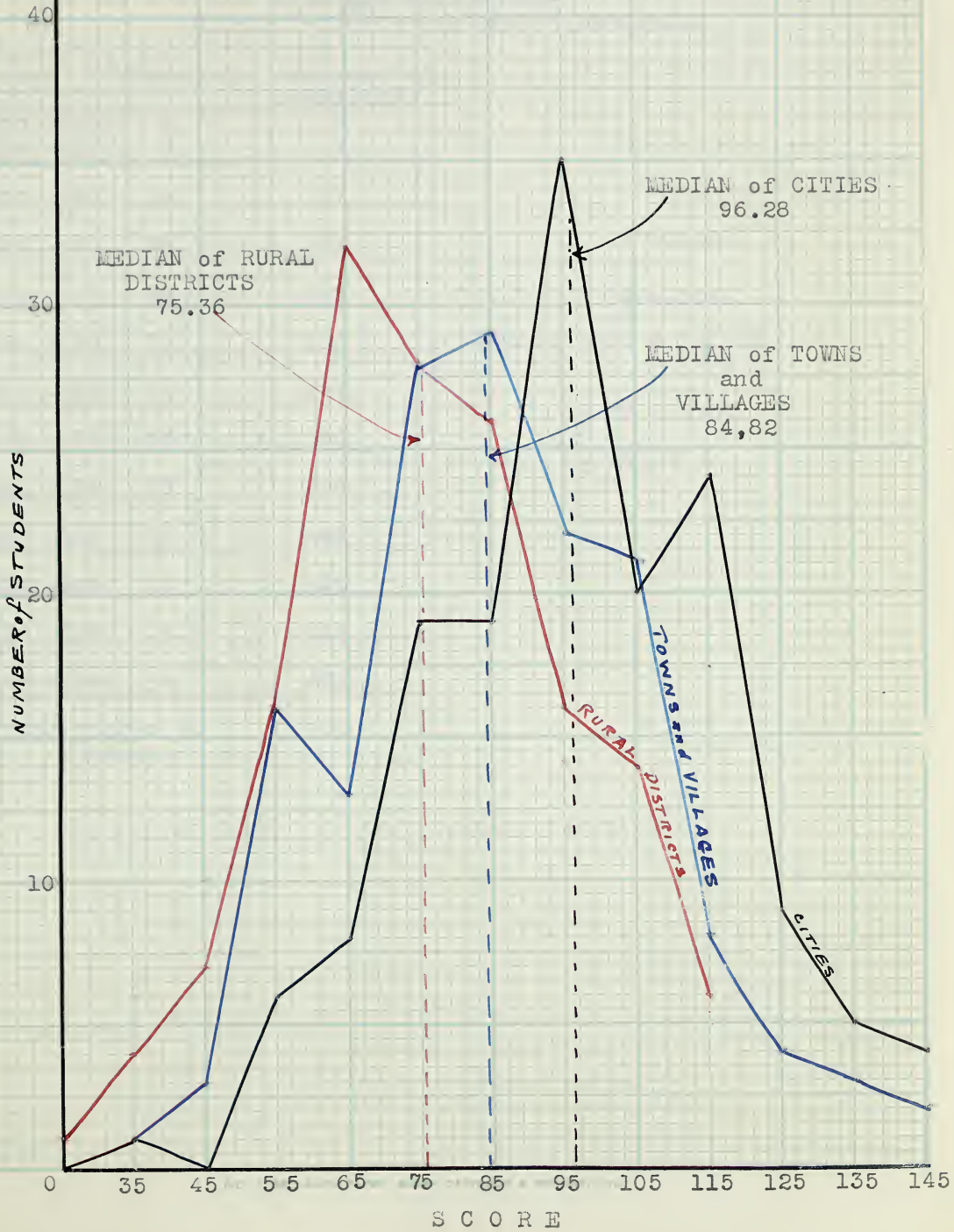


TABLE XIX
FREQUENCY TABLE
for
THE PROVINCE of ALBERTA
in
GENERAL SCIENCE and HEALTH EDUCATION

Score	Frequency	Accumulated frequency
20 - 29	1	1
30 - 39	6	7
40 - 49	10	17
50 - 59	38	55
60 - 69	53	108
70 - 79	75	183
80 - 89	74	257
90 - 99	73	330
100 -109	55	385
110 -119	38	423
120 -129	13	436
130 -139	8	444
140 -149	6	450
Total number of Students		450

$$N = 450$$

$$\frac{N}{2} = 225$$

$$\text{Median} = 80 + \frac{42 \times 10}{74}$$

$$= 80 + 5.67$$

$$= 85.67$$

The Median Score for the Province is 85.67.

Fig. 5. FREQUENCY POLYGON OF STUDENTS
for
THE DIFFERENT SCORES
MEDIAN FOR THE PROVINCE
 $N = 450$

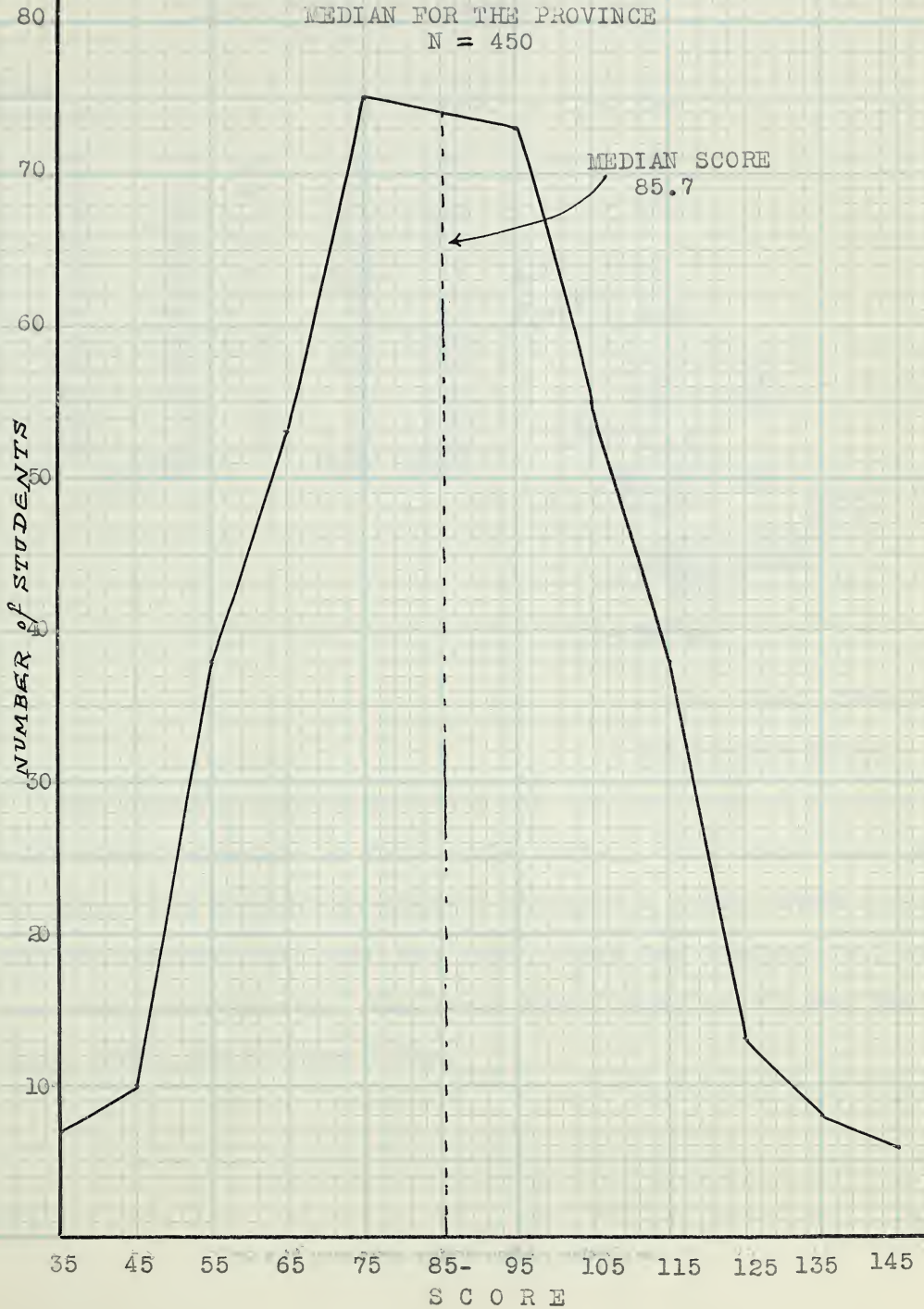




TABLE XX
STANDARD DEVIATION
in
GENERAL SCIENCE
for
THE PROVINCE of ALBERTA

Class Intervals	f	d	fd	fd ²	n = 450
30 - 39	7	-5	-35	175	$\sum fd = 425$
40 - 49	10	-4	-40	160	
50 - 59	38	-3	-114	342	$\sum fd = 370$
60 - 69	53	-2	-106	212	
70 - 79	75	-1	-75	75	$\sum fd = 55$
80 - 89	74	0	-370	0	
90 - 99	73	1	73	73	$\sum fd^2 = 2223$
100 - 109	55	2	110	220	
110 - 119	38	3	114	342	$c = \frac{\sum fd}{n} = \frac{55}{450} = 0.122$
120 - 129	13	4	52	208	
130 - 139	8	5	40	200	$c^2 = 0.02$
140 - 149	6	6	36	216	
N = 450			+ 425	2223	

$$\sigma = \sqrt{\frac{\sum fd^2}{n} - c^2}$$

class intervals

$$= \sqrt{\frac{2223}{450} - 0.02}$$

$$= \sqrt{4.92}$$

$$= 2.21 \text{ class intervals.}$$

$$= 22.1 \text{ scale units.}$$

The Standard Deviation (σ) for the Province of Alberta is 2.21 class intervals or 22.1 scale units. This means that two thirds of the student population obtained a score between sixty and one hundred ten; with one sixth above one hundred ten, and one sixth below sixty. The lower limit being thirty and the upper limit, one hundred fifty.

CHAPTER III

HEALTH EDUCATION

With the exception of the first question, the Health part of the paper is well answered. For question one, most of the candidates received a score of three out of ten as figure 6 indicates. Not one in the Province obtained the full score. The reason may be that the question goes beyond the plan in the programme of Health Education. Question one seeks to test the validity of assumed correlation as between Health Education and General Science. Unit three in the programme of studies has to do with, "what to do", not why it is done. Figure 7 shows that very few received full value for the different parts of the question.

Question two, according to figures 8 and 9, is a type of question that the students like; no one received a score below four and a few obtained the full ten marks. The full values for the different parts of this question are quite high as compared with the half values, see figure 8.

The reason for the low full values for part "e" may be due to the poor wording of the question. It reads: "Food poisoning is most commonly caused by "(1) eating.....tins"; (2) "eating.....(3) "eating.....etc". Does the question ask what causes food poisoning?

The frequency distribution curves in figure 10 show characteristic trends of the three groups. The curve of the city districts sags where the scores are low and is high for the larger scores. The red curve of the rural districts runs the very opposite to that of the city districts; it is high where the scores are low and sags at the other end. The curve of the town and village districts lies between the other two.

Question three is stated in a rather academic way. "Taking part in games and sports gives one a better mental outlook on life." It neither follows nor may be assumed that participation in games and sports "gives" a better mental outlook. Other strong factors have also to be considered. Sections (b) and (c) simply test very useful information.

Question four is a general review, some items of which go back to Grade VII, others to Grade VIII work in Health Education. This objective set-up makes a hit with students who do not indulge in too much thinking. Look at part (6) "meat inspection" is closely associated with the phrase "Canada Approved" or with the search for signs of tuberculosis.

Table XXVI and Figure 12 show that for some parts over 91% of the students obtained the correct answer. The curve for the city districts is definitely above the other two, the town and village, and the rural districts.

The graph of Figure 13 is jagged, but a careful observation will reveal that the curve for the city districts sags for the low scores on the left and rises sharply to the right for the high scores. It is difficult to see the trends of the other two curves, but at the two ends, the extreme left and the extreme right, the characteristic signs appear with the red, rural curve above the other two on the left, for the low scores, and below the other two on the right, for the high scores.

The course in Health Education as in General Science is too long and too exacting for the time allotted.



HIGH SCHOOL ENTRANCE EXAMINATION BOARD

DEPARTMENTAL EXAMINATIONS, 1940

GRADE IX

GENERAL SCIENCE AND HEALTH EDUCATION

Time--2½ hours.

Study these instructions very carefully before opening this booklet.

1. Pay particular attention to the directions at the beginning of each section or question so that you will know exactly what to do.
2. If you do not know the answer to a question, go on to the next. You may not know all the answers, but answer as many questions as you can in the time allowed.
3. Questions 5, 6 and 7 are "Essay Type" questions and are to be answered on foolscap. All other questions are to be answered in the spaces provided.

The Answer Envelope:

When you have finished, fold this booklet and insert in the fold the foolscap pages on which you have written the answers to Part II. Then place the booklet in the answer envelope, and seal securely.

CANDIDATE'S NUMBER

(For examiner's use only)

PART	SCORE
I	
II	
III	
TOTAL	

(For examiner's use only)

QUESTION ONE

Value

PART I - HEALTH EDUCATION

General Directions for Part I:

This part is to be answered in the spaces provided in this answer booklet.

10 1. Directions:

State the scientific reason for each of the following first-aid measures.

- (a) Applying cold water to a sprained ankle.

Cold contracts the blood vessels and so checks swelling.
.....
.....

- (b) Crawling on one's **hands** and knees out of a smoke-filled room.

Heated air rises taking the smoke upwards. Air is
.....
better near the floor.
.....

- (c) Applying a wet dressing to a burn.

Prevents evaporation and consequent pain and
.....
formation of scar.
.....

- (d) Wrapping in warm blankets a person who has fainted.

Increases capacity of blood vessels, aiding restoration
.....
of circulation.
.....

- (e) Applying hot compresses to a sty or a boil.

Heat dilates the blood vessels to bring more blood to
.....
the part. This extra volume of blood carries many white
.....
blood cells which overcome the infection.
.....

TABLE XXI

DETAILED FREQUENCY DISTRIBUTION OF STUDENTS
for
QUESTION ONE

	Cities	Towns and Villages	Rural Districts
(a) Full			
Value	12 or 8%	8 or 5.33%	4 or 2.67%
Half			
Value	113 or 75.33%	116 or 77.33%	113 or 75.33%
(b) Full			
Value	40 or 26.67%	34 or 22.67%	25 or 16.67%
Half			
Value	74 or 49.67%	80 or 53.33%	77 or 51.33%
(c) Full			
Value	31 or 20.67%	34 or 22.67%	37 or 23.67%
Half			
Value	52 or 34.67%	49 or 32.67%	37 or 23.67%
(d) Full			
Value	11 or 7.33%	7 or 4.67%	13 or 8.67%
Half			
Value	40 or 26.67%	46 or 30.67%	45 or 30%
(e) Full			
Value	1 or 2/3 of 1%	4 or 2.67%	1 or 2/3 of 1%
Half			
Value	36 or 24%	22 or 14.67%	24 or 16%

TABLE XXIa

FREQUENCY DISTRIBUTION OF STUDENTS
for
QUESTION ONE

Score	0	1	2	3	4	5	6	7	8	9	10
Cities	2	14	34	37	29	15	14	3	2	0	0
Towns & Villages	3	18	39	29	31	13	8	6	2	1	0
Rural	4	21	32	37	33	15	6	2	0	0	0

Fig. 6- FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION ONE

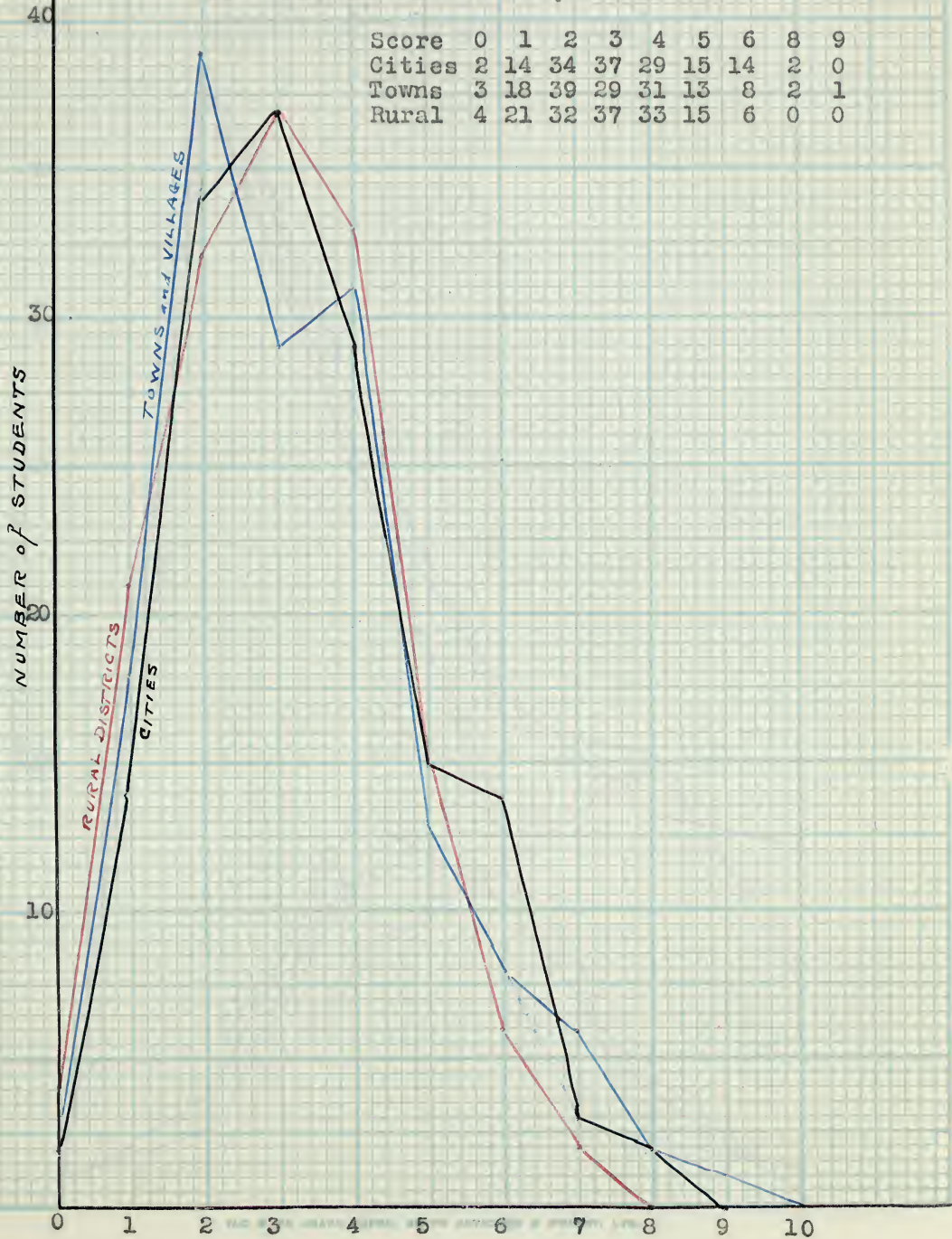
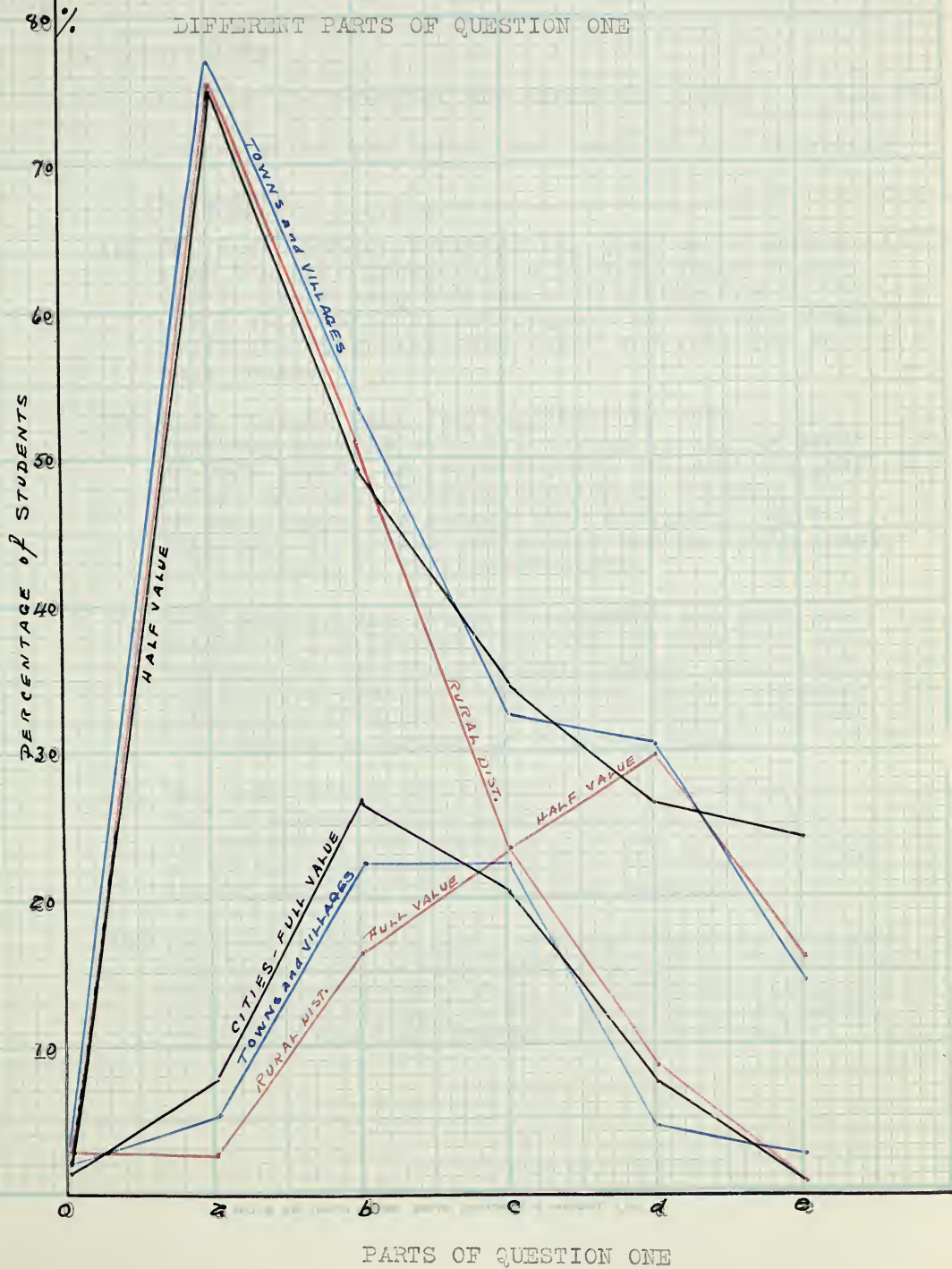




Fig.7.- DISTRIBUTION OF STUDENTS
for
FULL AND HALF VALUES OF THE
DIFFERENT PARTS OF QUESTION ONE





QUESTION TWO
with
ANSWERS

Value

10 2. Directions:

Place in the boxes at the right the numbers of the TWO phrases which you think best complete the following statements.

- (a) The best method of preventing pimples or acne is (1) to wash the face frequently with warm soapy water; (2) to avoid soap but use cold cream; (3) to use a skin tonic or astringent; (4) to eat simple foods avoiding excessive sugar and fat; (5) to take yeast.

1
4
- (b) Good friends make for happiness in life. The best way to cultivate friendship is (1) to meet as many people as possible; (2) to have one good friend and pay little attention to others; (3) to be sincere and honest with everyone; (4) to take part in social activities and do one's share; (5) to learn to influence people.

3
4
- (c) Good posture and grace of movement are best acquired by (1) learning to feel at ease in a situation; (2) carefully chosen posture exercises; (3) wearing shoulder braces; (4) having somebody remind you frequently to sit and stand straight; (5) playing a variety of vigorous games.

2
5
- (d) The best method of combatting the housefly is (1) to remove manure piles from the vicinity; (2) to build fly traps; (3) to set out fly poison or sticky paper; (4) to screen windows and doors; (5) to swat the first fly that appears.

1
4
- (e) Food poisoning is most commonly caused by (1) eating food left in open tins; (2) eating frozen food; (3) eating food that does not agree with you; (4) eating food exposed to dust and flies; (5) eating food that has been stored in a warm place.

4
5

TABLE XXII
DETAILED FREQUENCY DISTRIBUTION OF STUDENTS
FOR
QUESTION TWO

	Cities	Towns and Villages	Rural Districts
Part (a) Full Value	104 or 69.33%	95 or 63.33%	86 or 57.33%
Half Value	44 or 29.33%	51 or 34%	61 or 40.67%
(b) Full Value	125 or 83.33%	127 or 84.67%	118 or 78.67%
Half Value	24 or 16%	21 or 14%	31 or 20.67%
(c) Full Value	62 or 41.33%	85 or 56.67%	69 or 46%
Half Value	80 or 53.33%	63 or 42%	78 or 52%
(d) Full Value	90 or 60%	91 or 60.67%	80 or 53.33%
Half Value	58 or 38.67%	55 or 36.67%	67 or 44.67%
(e) Full Value	38 or 25.33%	37 or 24.67%	22 or 14.67%
Half Value	104 or 69.33%	107 or 71.33%	116 or 77.33%

TABLE XXIII
FREQUENCY DISTRIBUTION OF STUDENTS
for
QUESTION TWO

Score	0	1	2	3	4	5	6	7	8	9	10
Cities				0	3	3	19	38	49	33	5
Towns & Villages				0	1	3	14	34	56	38	4
Rural				0	1	12	24	35	49	26	3

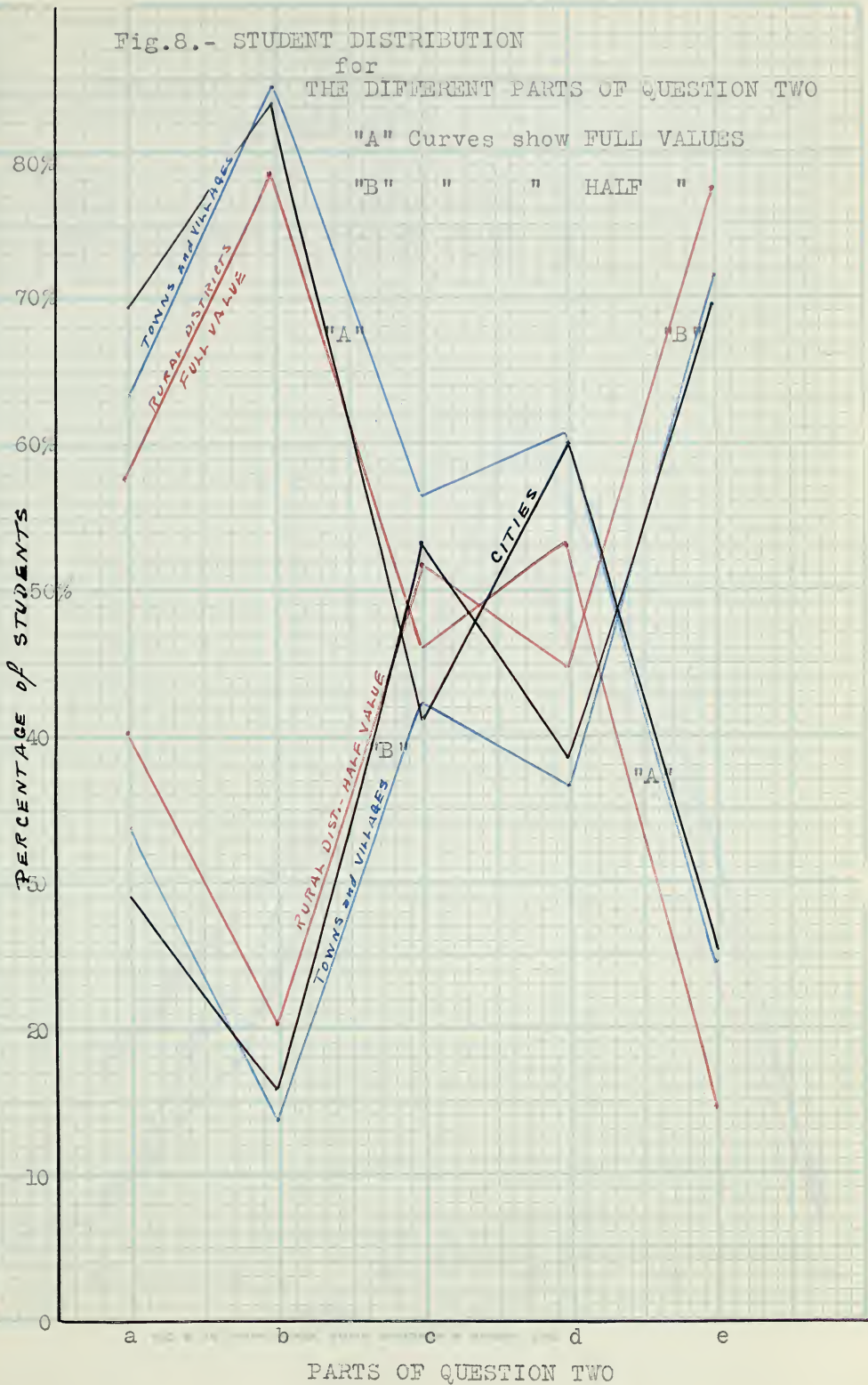
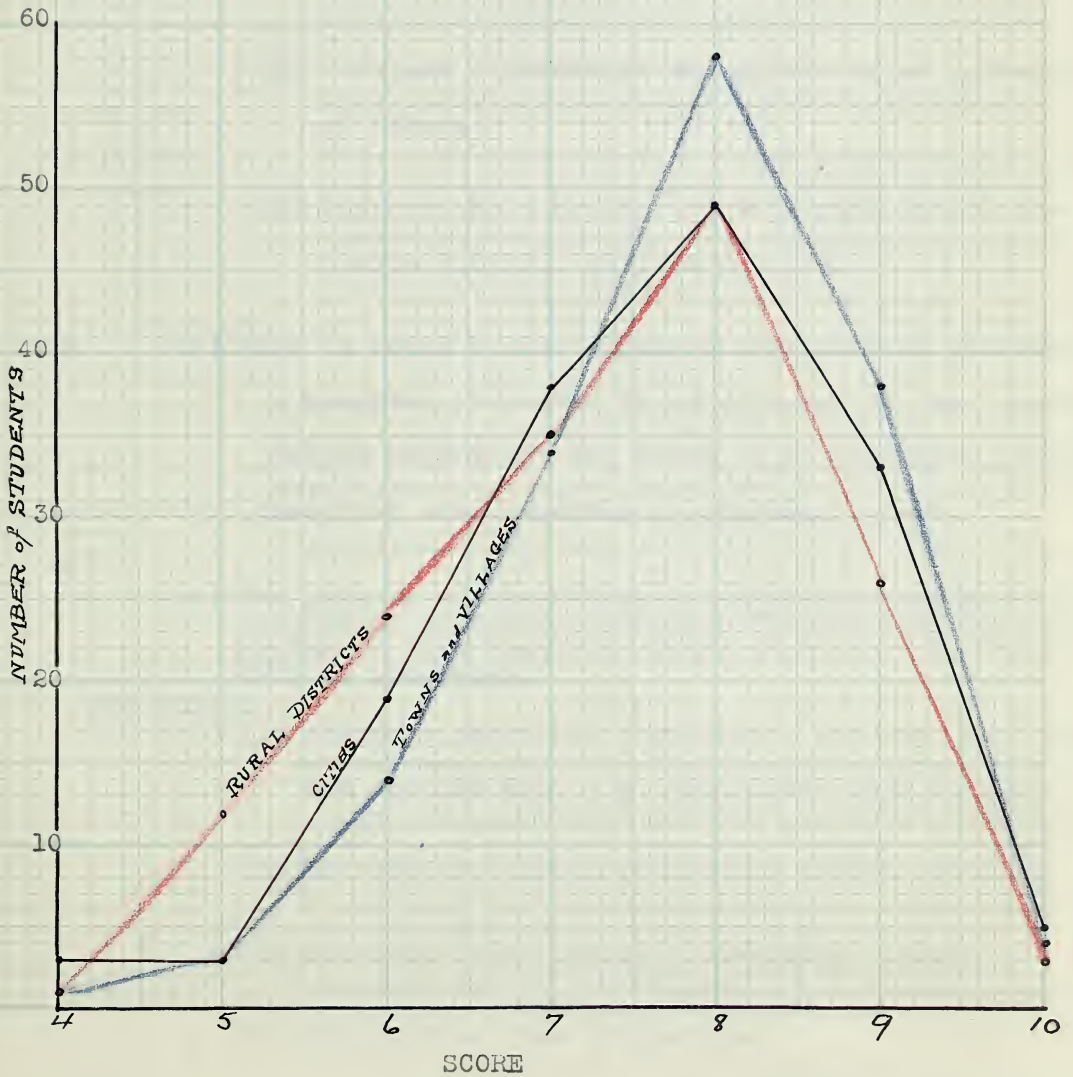




Fig. 9- FREQUENCY DISTRIBUTION OF STUDENTS
for
QUESTION TWO

Score	4	5	6	7	8	9	10
Cities	3	3	19	38	49	33	5
Towns & Villages	1	3	14	34	56	38	4
Rural Districts	1	12	24	35	49	26	3



QUESTION THREE
with
ANSWERS

Values

3. Directions.
Give brief answers to each of the following questions.

- 2 (a) Taking part in games and sports gives one a better mental outlook on life. Why? Give two reasons.

Any two:

- (1) Teaches one to be a good sport; to accept defeat
.....
with good grace and to abide by the rules of the
.....
game.
.....
- (2) Develops friendships and gives one an appreciation
.....
of others.
.....
- (3) Improve one's health and with good health one has
.....
a more cheerful outlook on life.
.....

- 2 (b) What is meant by an "approved hospital" in Alberta?

A hospital inspected by an official of the Provincial
.....
Health Department and rated as satisfactory. Such a
.....
hospital also receives a government grant.
.....

- 3 (c) The purpose of the Provincial Health Department is to conduct an effective programme for the promotion of health in this Province. State three ways in which this is attempted.

Any three:

- (1) Passes appropriate regulations and sees that they
.....
are carried out, e.g. quarantine regulations.
.....
- (2) Provides for free lectures on health problems.
.....
- (3) Provides free clinics, travelling nurses.
.....
- (4) Distributes free literature.
.....
- (5) Inspects hospitals, jails, baby homes, etc.
.....

TABLE XXIV

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT PARTS OF QUESTION THREE

Part	Number of Students out of 150 for each of the three groups.		
	Cities	Towns and Villages	Rural Districts
1			
(a)mark	83 or 55.33%	79 or 52.67%	80 or 53.33%
2 marks	43 or 28.67%	46 or 30.67%	40 or 26.67%
1			
(b)mark	44 or 29.33%	40 or 26.67%	30 or 20%
2 marks	44 or 29.33%	35 or 23.33%	29 or 19.33%
1			
(c)mark	46 or 30.67%	48 or 32%	45 or 30%
2 marks	68 or 45.33%	55 or 36.67%	44 or 29.33%
3 "	23 or 15.33	25 or 16.67%	27 or 18%

TABLE XXV

FREQUENCY DISTRIBUTION OF STUDENTS
for

THE DIFFERENT SCORES OF QUESTION THREE

Score	0	1	2	3	4	5	6	7
Cities	4	10	18	36	33	27	19	2
Towns and Villages	4	14	27	32	30	26	9	6
Rural Districts	9	16	31	36	29	16	9	4

Fig.10- FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION THREE

Score	0	1	2	3	4	5	6	7
Cities	4	10	18	36	33	27	19	2
Towns	4	14	27	32	30	26	9	6
Rural	9	16	31	36	29	16	9	4

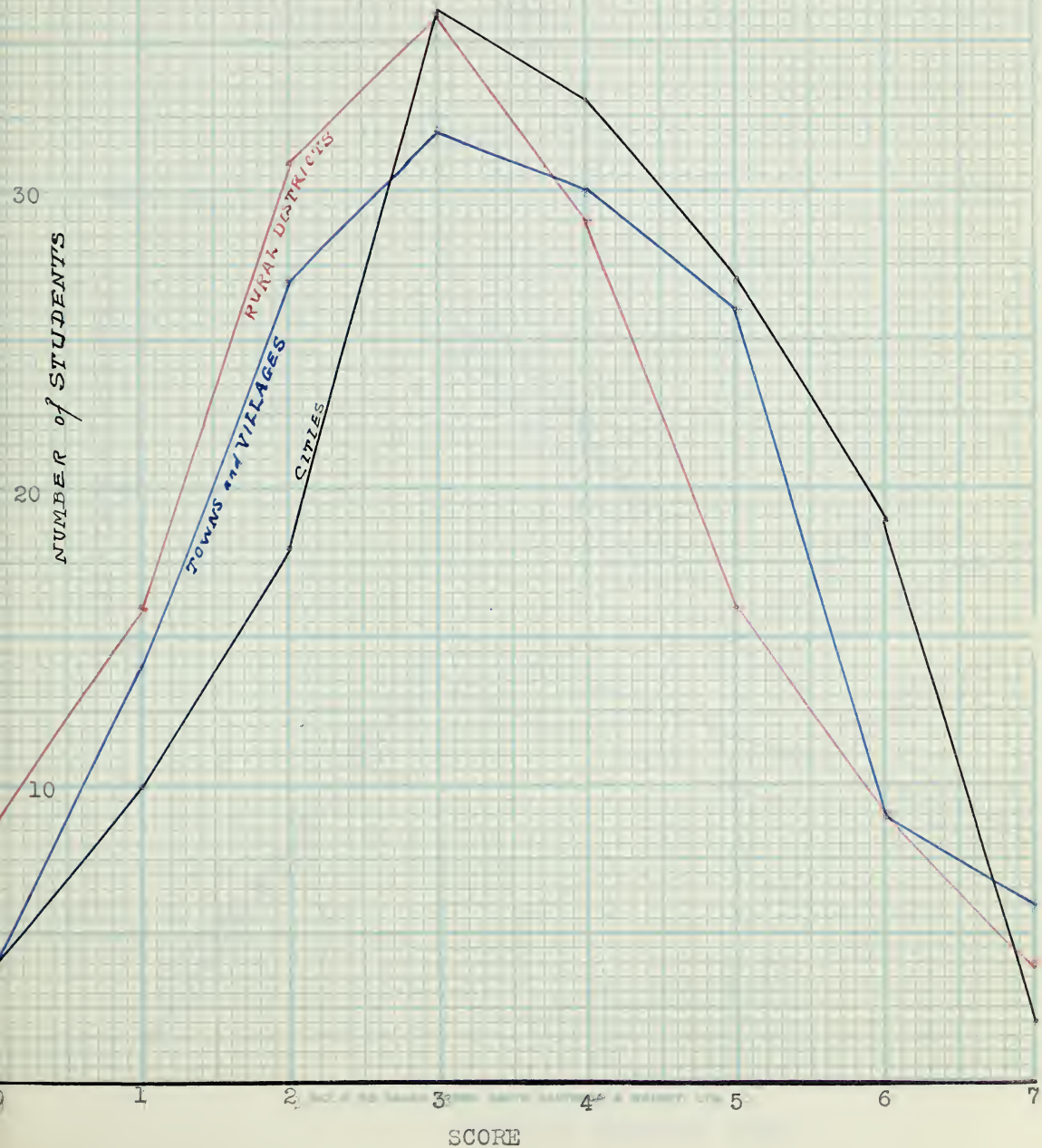
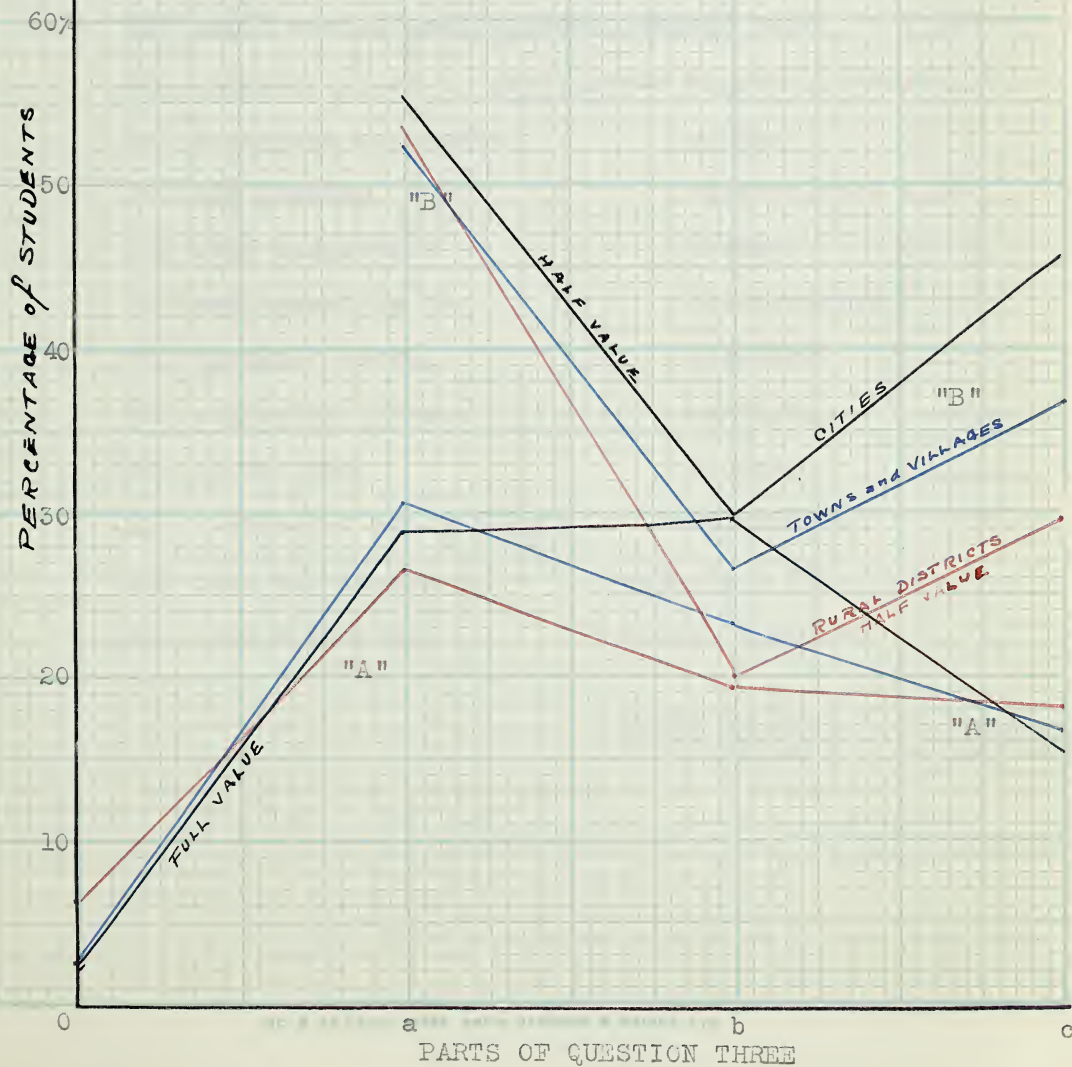


Fig.11.- STUDENT DISTRIBUTION
for
THE DIFFERENT PARTS OF
QUESTION THREE

"A" Curves show FULL VALUES

"B" " " HALF "





QUESTION FOUR
with
ANSWERS

Value

12 4. Directions:

For each item in Column II, select the item of Column I with which it is most closely associated, and place the corresponding number in the space provided.

Example: alum, is used to create a floc or precipitate; therefore number (3) would be placed to the right of the word "alum".

COLUMN I	COLUMN II	ANSWERS
(1) bacteria in milk	alum	(..3...)
(2) solid wastes precipitated	Babcock Test	(..10..)
(3) creates a floc or percipitate	night-blindness	(.12.)
(4) increases accidents	sludge	(...2...)
(5) egg grading	tuberculosis	(..11...)
(6) meat inspection	alcohol	(...4...)
(7) adulterant in jam	chlorination	(...8...)
(8) typhoid control	carotene	(...9...)
(9) source of vitamin A	candling	(...5...)
(10) butter fat	glucose	(...7...)
(11) disease of young people	metabolism	(..13...)
(12) lack of vitamin A	Methylene Blue Test	(.1...)
(13) food combustion	Canada Approved	(...6...)

Score in Part I
(To be filled in by examiner)

TABLE XXVI

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT PARTS of QUESTION FOUR

Part of Question 4.	Number of Students with Correct Answers.		
	Cities	Towns and Villages	Rural Districts
(1)	75 or 50%	60 or 40%	50 or 33.33%
(2)	94 or 62.67%	71 or 47.33%	78 or 52%
(4)	125 or 83.33%	125 or 83.33%	126 or 84%
(5)	137 or 91.33%	127 or 84.67%	119 or 79.33%
(6)	134 or 89.33%	113 or 75.33%	98 or 65.33%
(7)	65 or 43.33%	44 or 29.33%	47 or 31.33%
(8)	99 or 66%	75 or 50%	75 or 50%
(9)	82 or 54.67%	78 or 52%	81 or 54%
(10)	81 or 54%	72 or 48%	65 or 43.33%
(11)	112 or 74.67%	99 or 66%	103 or 68.67%
(12)	81 or 54%	71 or 44%	84 or 56%
(13)	93 or 62%	70 or 46.67%	61 or 40.67%

TABLE XXVII

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION FOUR

Score	0	1	2	3	4	5	6	7	8	9	10	11	12	
Cities	0	1	2	6	10	11	20	15	23	15	22	1	23	
Towns & Villages	2	1	9	11	12	22	17	19	13	15	15	0	14	
Rural Districts	2	7	5	1	3	12	22	13	16	17	7	23	2	11

STUDENT DISTRIBUTION
for
THE DIFFERENT PARTS OF QUESTION 4.

Figure 12.



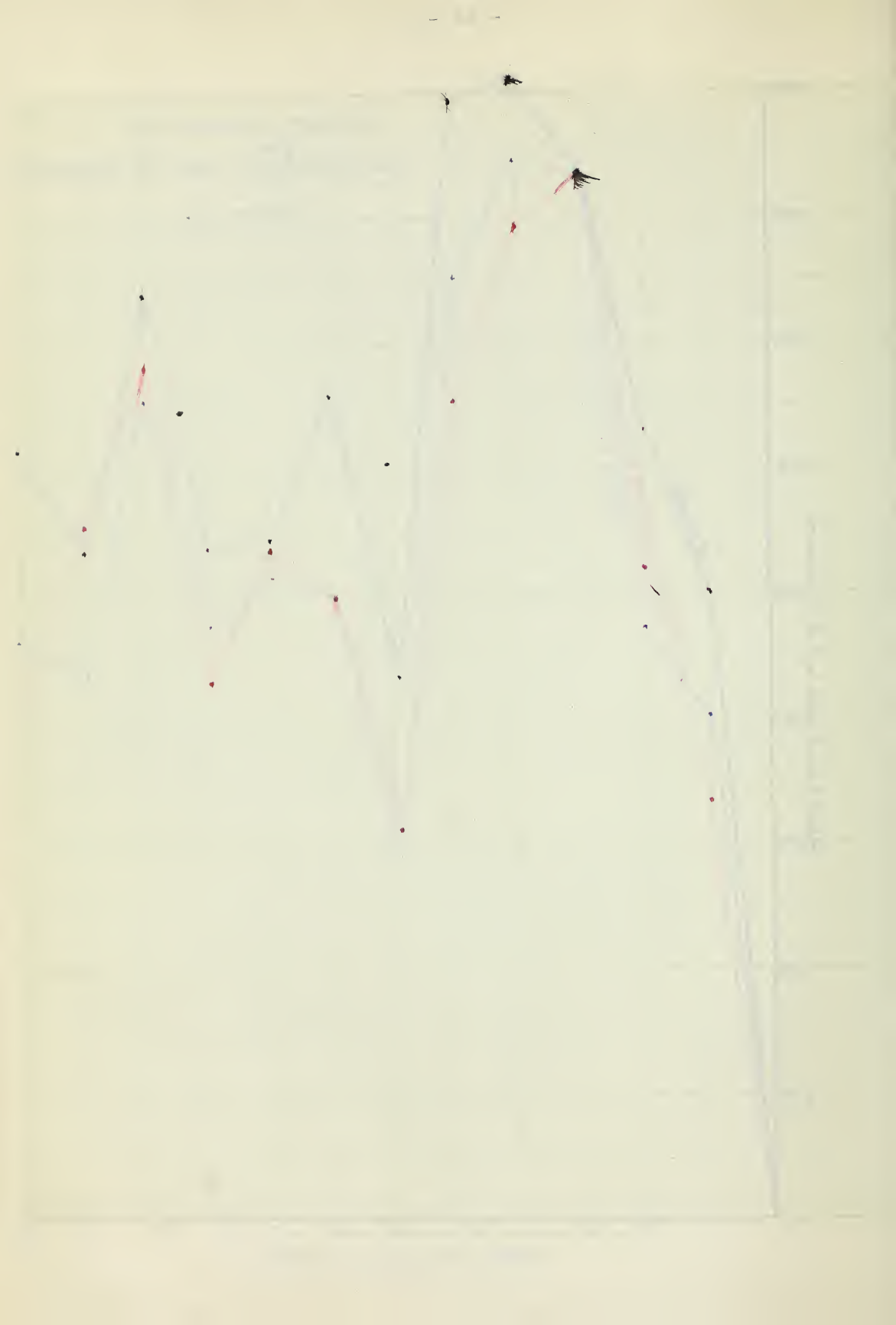
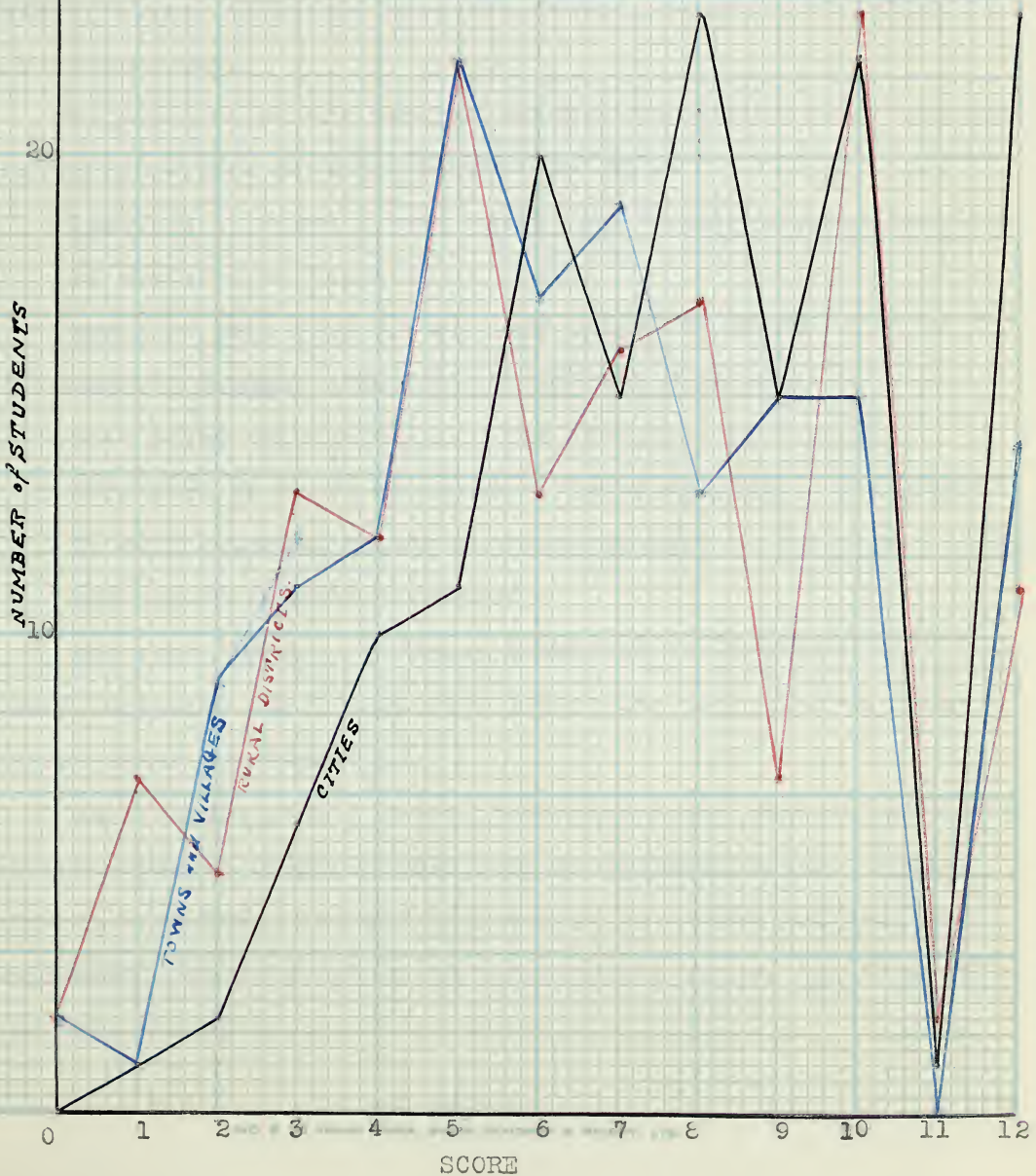


Fig.13- FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION FOUR

Score	0	1	2	3	4	5	6	7	8	9	10	11	12
Cities	0	1	2	6	10	11	20	15	23	15	22	1	23
Towns	2	1	9	11	12	22	17	19	13	15	15	0	14
Rural	2	7	5	13	13	22	13	16	17	7	23	2	11





CHAPTER IV

ESSAY QUESTIONS IN GENERAL SCIENCE

Question five, which is the first one in the General Science proper, received the poorest marks, for at least three reasons that are clearly evident: first, the student may have misinterpreted the word "Essay"; second, the student did not know the Scientific Method; third, if he did know the method, he could not apply it in a practical way.

On page one of the General Science and Health Education paper, the third section of the instructions says:

Question 5, 6, and 7 are "Essay Type" questions and are to be answered on foolscap.

Again on page four of the same paper, it says:

PART II - ESSAY QUESTIONS IN GENERAL SCIENCE.

Just below this heading in the directions, it says:

This part is to be answered on foolscap paper. Your answer to each question should be from one-half to one page in length, and should be well expressed.

The word "Essay" or "Essay Questions in General Science" appeared forty-one (41) times or 9.11% in the four hundred fifty papers under consideration.

As a result of all these instructions and directions 80.42% of the students answered this part on foolscap paper. These answers were from one-half to one page in length and were well expressed, yet only 2/3 of 1% received six marks, the full value for that question.

This seems a clear indication that too much stress was placed on the word "Essay" and that at least part of the fault may be placed on the persons responsible for the setting of the paper.

Regardless what has been said about the word "Essay", question five distinctly asks for the Scientific Method which involves at least six steps: AIM, GATHER DATA, METHOD: INTERPRETATION OF DATA, OBSERVATIONS, CONCLUSION, and APPLICATION. It reads as follows:

How would you use the scientific method in attempting to solve one of the following problems:

- (a) How can we make our school more comfortable in hot weather?
- (b) Why do some people seem to dislike me?
- (c) Is LACTAN (an assumed remedy for colds) really good for a cold?

96.66% of the students did attempt to solve the problem.

92.9% answered it in Essay form. Some of these were less than one-half page in length.

80.42% of the students have essays from one-half to one page in length.

76.44% of the students chose part (a).

10.88% chiefly girls in the cities chose part (b).

5.55% chose part (c).

3.77% used the Scientific Method.

3.33% failed to try the question.

The rural schools seem less comfortable because more people were impressed with problem (a).

The few who chose Lactan were from town and village districts.

A number of these essays have been reproduced to show the type of answers that were given.

Question six was also poorly answered; it required planning and a number of points in the answer. Part one calls for Principles he has studied earlier which most of them were unable to apply. The diagram, in the second choice, seems to have attracted the attention of most of the students. This question is too difficult for the grade, as the results show.

Question seven is an easy problem and the scores should be higher than what they are. Here again many students were unable to apply the principles they had studied earlier in Science and Social Studies. The second choice of question seven is a problem in Social Studies and far too advanced for the grade.

QUESTION FIVE

Value

- 6 5. Directions:
This part is to be answered on foolscap paper. Your answer to each question should be from one-half to one page in length, and should be well expressed.

How would you use the scientific method in attempting to solve one of the following problems:

- (a) How can we make our school more comfortable in hot weather?
- (b) Why do some people seem to dislike me?
- (c) Is LACTAN, (an assumed remedy for colds) really good for a cold?

ANSWERS TO QUESTION FIVE

This is an application of the scientific method: This question shall be marked on the organization of data.

ONE POINT EACH FOR EACH OF THE SIX STEPS.

5. (a) (b) (c) (Combined)

1. AIM: To

2. GATHER DATA:

Take stock of school conditions as observed; OR take stock of traits of self; OR note characteristics of LACTAN such as taste, color, odor, strength.

3. METHOD: INTERPRETING DATA.

Suggest hypothetical improvements for the school such as sweeping compounds, screen or gauze for windows, window boards, screen door, window shades, covered water pail, sprinkling floor, etc.

OR: Suggest improvements in behavior of self and try them out-e.g. greater readiness to meet people, cheeriness, no boisterousness.

OR: Write to the Department of Public Health, Edmonton, for ruling on Lactan. Consult others who may have tried it. Consult a physician.

4. OBSERVATION:

Check hypotheses to note improvement in room comfort.

OR: Note improved relations with others.

OR: If Department of Public Health rules favorably, try Lactan when you have a cold.

5. CONCLUSION:

Take stock of results. Are you satisfied with them?

6. Application: Are the methods used in practice?

ESSAY 571

How Can We Make Our School More Comfortable
In Warm Weather?

In our school there is an air conditioning system that had not been used for several years. When the Junior High School was established in Balmoral, repairs were made on the air conditioning plant and it was put to work. Several rules had to be laid down, however, concerning the opening of windows. To operate correctly and with the best results this air conditioning system could not have any interfering drafts to upset the circulating, cool air currents.

It was quite difficult for a while to get used to leaving the windows closed, as we even had monitors assigned to the special job of opening and closing the windows.

Now the air-cooling system seems to be working quite satisfactorily. In the hottest of weather the school is cool and comfortable, which, I believe, has improved the standard of school work done by the students, a great deal.

Candidate #571.

ANNUAL REPORT OF THE
COMMISSIONER OF THE LAND OFFICE

The first object of the Commission is to ascertain the extent of the public lands in the State of New York, and to determine the manner in which they should be disposed of. The second object is to ascertain the value of the public lands, and to determine the manner in which they should be sold. The third object is to ascertain the manner in which the public lands should be managed, and to determine the manner in which they should be improved. The fourth object is to ascertain the manner in which the public lands should be protected, and to determine the manner in which they should be preserved. The fifth object is to ascertain the manner in which the public lands should be distributed, and to determine the manner in which they should be allocated. The sixth object is to ascertain the manner in which the public lands should be surveyed, and to determine the manner in which they should be mapped. The seventh object is to ascertain the manner in which the public lands should be recorded, and to determine the manner in which they should be indexed. The eighth object is to ascertain the manner in which the public lands should be sold, and to determine the manner in which they should be conveyed. The ninth object is to ascertain the manner in which the public lands should be managed, and to determine the manner in which they should be improved. The tenth object is to ascertain the manner in which the public lands should be protected, and to determine the manner in which they should be preserved. The eleventh object is to ascertain the manner in which the public lands should be distributed, and to determine the manner in which they should be allocated. The twelfth object is to ascertain the manner in which the public lands should be surveyed, and to determine the manner in which they should be mapped. The thirteenth object is to ascertain the manner in which the public lands should be recorded, and to determine the manner in which they should be indexed. The fourteenth object is to ascertain the manner in which the public lands should be sold, and to determine the manner in which they should be conveyed. The fifteenth object is to ascertain the manner in which the public lands should be managed, and to determine the manner in which they should be improved. The sixteenth object is to ascertain the manner in which the public lands should be protected, and to determine the manner in which they should be preserved. The seventeenth object is to ascertain the manner in which the public lands should be distributed, and to determine the manner in which they should be allocated. The eighteenth object is to ascertain the manner in which the public lands should be surveyed, and to determine the manner in which they should be mapped. The nineteenth object is to ascertain the manner in which the public lands should be recorded, and to determine the manner in which they should be indexed. The twentieth object is to ascertain the manner in which the public lands should be sold, and to determine the manner in which they should be conveyed.

THE COMMISSIONER OF THE LAND OFFICE
ALBANY, N. Y., 1875

ESSAY 4509

How Can We Make Our School More Comfortable In
Hot Weather?

Making our school comfortable in hot weather is a very important thing especially for the welfare of the pupils because in warm weather one is not able to concentrate or think as well as he might. To make our school more comfortable for this many famous scientists have experimented for making the school a better, cooler and a more enjoyable place to work in. Today we have air-conditioning plants all over the world and it would be better to have one of these wonderful scientific discoveries in each school. When it is very hot outside, the air-conditioning plant would do much in making it cool and comfortable.

The air-conditioning plant regulates the temperature with water rushing in it and cleaning it; the air is put through a special screen which takes out all the little dust particles. There is another special apparatus which further purifies the air before it is distributed throughout the building by special pipes and registers. It then is forced into the room by fans and the used air is forced out through another register.

Candidate #4509.

ESSAY 4629

Is LACTAN, (An Assumed Remedy For Colds)

Really Good For A Cold?

To prove that Lactan was really good for colds I would firstly get about eight people having colds to agree with the experiment and follow directions. I would then give four of them Lactan for a specified time and the other four would be divided in half. Two of them taking some other well-known remedy and the other two taking nothing.

After a few days of treatment I would check the results.

If three out of the four who took Lactan were cured and the four taking another remedy or nothing, were not, I would then be fairly sure that Lactan was a good remedy for colds.

I would, however, try this experiment many times, and on many types of people to make absolutely sure.

Candidate #4629.

This student ~~certainly~~ knows something about science, yet fails to give the Scientific Method with its six steps.

THE HISTORY OF THE
CITY OF BOSTON
FROM 1630 TO 1800

The first settlement in Boston was made in 1630 by a group of Puritan settlers from England. They came to the city in search of religious freedom and a place to practice their faith. The settlers were led by John Winthrop, who gave them the name "Boston" in honor of the city of Boston in England. The city grew rapidly and became one of the most important centers of commerce and industry in the New England region.

In 1689, the city was captured by British forces during the Battle of the Clouds. The British then established a military government in the city, which lasted until 1776. During this time, the city was known as the "City of the Clouds" and was a major center of British power in the region. The city was also the site of the Boston Tea Party in 1773, a protest against British taxation that led to the American Revolution.

The city of Boston was a major center of commerce and industry in the New England region. It was also a major center of education and culture. The city was home to many of the most important universities and colleges in the United States, including Harvard University and Boston University. The city was also a major center of the arts and sciences, and was home to many of the most important figures in American history.

ESSAY 631

Is LACTAN, (An Assumed Remedy For Colds) Really
Good For Colds?

To prove whether or not Lactan is really a good remedy for a cold would require a careful experiment with human beings. About six persons would be required to volunteer for such an experiment. Three would use Lactan when they become ill with a cold while the other three would not take any medicine but take good care of themselves when having a cold. If more people would take part in such an experiment the results would probably be more satisfactory.

When a person has a cold he should report it to the person conducting the experiment, who would make a record of it. Those taking Lactan would have to take similar doses at regular intervals and constantly report their condition to the person recording the results.

Careful records would have to be kept and correct observations made. Then when the six people who had had colds had overcome them, the records could be referred to and conclusions drawn. If those who took Lactan recovered from their colds sooner in every case than those not taking it, the natural conclusion would be that Lactan was a good remedy for colds. However, if those who took Lactan showed no great improvement over those not taking it, the conclusion would be against the use of this for colds.

Candidate #631.

This Calgary student has an excellent scientific solution for the problem, yet has failed to organize the data as required by the Scientific Method.

ESSAY 3698

Why Do Some People Seem To Dislike Me?

There may be many reasons why a person may not like you. First of all - "Do you take part in games?" If not proceed to do so even if you are no star in sports. Go ahead and learn a few games and do them well. Secondly - "Do you act freindly towards your fellow friends?" Give people a pleasant smile and develop your personality to a more friendly and chummy attitude. Have you a sense of responsibility? Don't pass your troubles on to another person to worry about. Paddle your own canoe. Fourthly "Have you any will power?" Learn to refuse the "wrong" and your friends will respect you all the more. "Do you boast?" If you feel that you have accomplished something worth boasting about don't bother yourself about it, your friends will find out sooner or later. Don't acquire an inferiority complex. All these reasons and suggestions may help a lot in the acquiring of friends and making them like you.

Candidate #3698.

Here we have again an Essay with six reasons why a person may not like you and how to correct these faults, yet the material is not set out in the required organized manner.

ESSAY 2878

Why Some People Dislike Me?

Some people dislike me for reasons I do not know. There are many whom I meet the first day and on the next they will speak to me in a way which seems to me like they just don't care to speak to me. Then I change the subject and still they won't listen to me and walk away.

I think they are jealous of me because I make higher marks than they do in some subjects. When people ask me for my marks, I tell them that I got so many and they ask me why. So I tell them that I studied hard and earned my marks that way, but they think that I cheated. So they leave me and don't speak to me again.

When I am on the playground, I never get my bats when playing baseball. Or when playing football they never pass the ball to me; so I have to just run around and do what I can.

In the science room I am always helping the science teacher with experiments. The other people are jealous because I help him and they can't. And when they do help him, they break some of the equipment and he gets angry and tells them to sit down. Then he will ask me to help him again which I do quite willingly.

So I think I will try hard to be nice to them, but if I don't succeed I will have to do what I can.

Candidate #2878.

It seems to me that this boy has analysed the problem and has given a scientific reason why other students dislike him, yet he has not used the Scientific Method and receives only one mark for giving the interpretation of the data.

the first of these was the discovery of gold in California in 1848. This discovery led to a great influx of people to California, and the state became one of the most populous in the Union. The second was the discovery of gold in Nevada in 1859. This discovery led to a great influx of people to Nevada, and the state became one of the most populous in the Union.

The third was the discovery of gold in Colorado in 1859. This discovery led to a great influx of people to Colorado, and the state became one of the most populous in the Union. The fourth was the discovery of gold in Idaho in 1860. This discovery led to a great influx of people to Idaho, and the state became one of the most populous in the Union.

The fifth was the discovery of gold in Montana in 1862. This discovery led to a great influx of people to Montana, and the state became one of the most populous in the Union. The sixth was the discovery of gold in Wyoming in 1869. This discovery led to a great influx of people to Wyoming, and the state became one of the most populous in the Union.

The seventh was the discovery of gold in Utah in 1871. This discovery led to a great influx of people to Utah, and the state became one of the most populous in the Union. The eighth was the discovery of gold in Arizona in 1872. This discovery led to a great influx of people to Arizona, and the state became one of the most populous in the Union.

The ninth was the discovery of gold in New Mexico in 1873. This discovery led to a great influx of people to New Mexico, and the state became one of the most populous in the Union. The tenth was the discovery of gold in Texas in 1874. This discovery led to a great influx of people to Texas, and the state became one of the most populous in the Union.

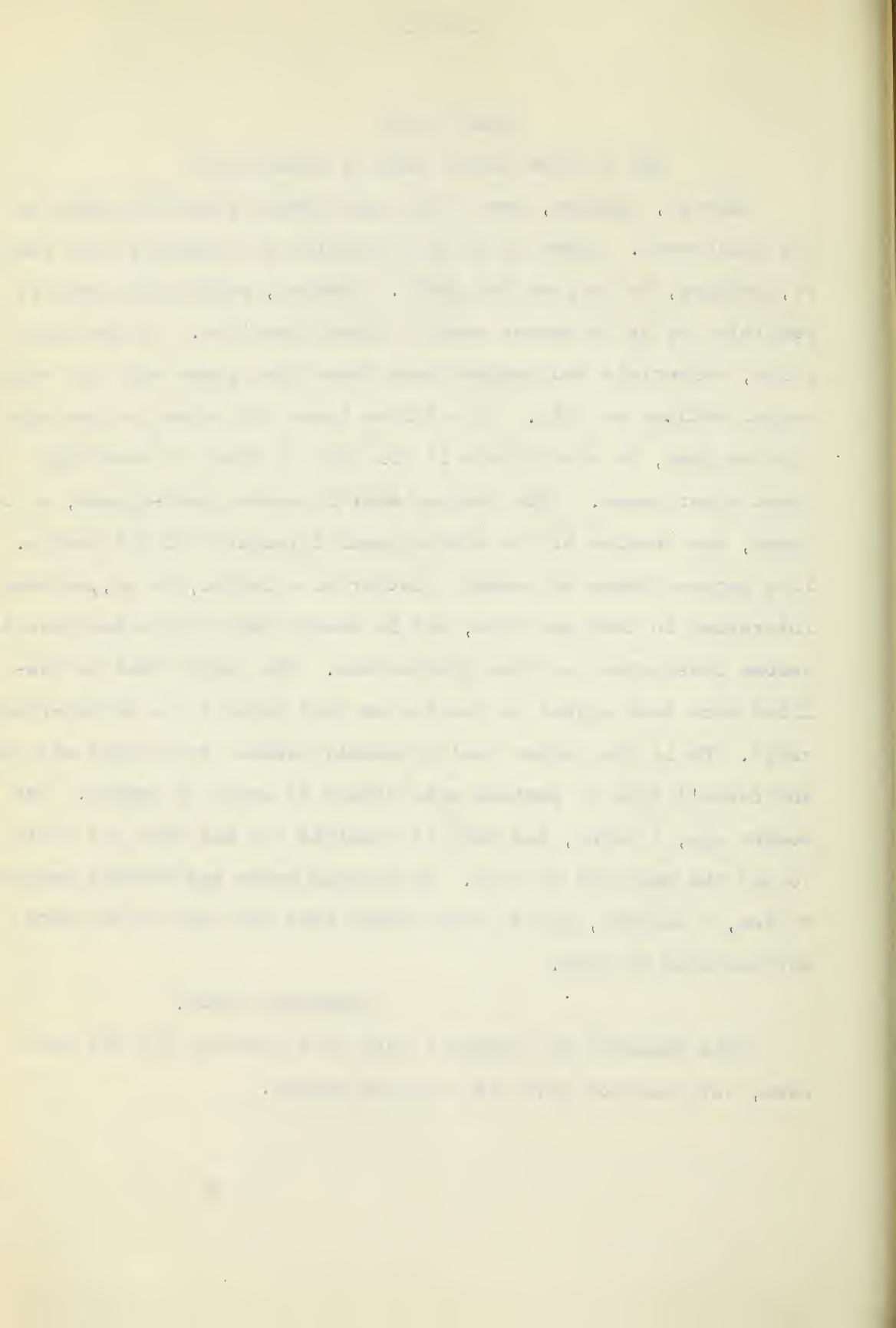
ESSAY 2638

Why Do Some People Seem To Dislike Me?

This is, perhaps, one of the most common questions asked by the adolescent. Maybe it is his inability to cooperate with others or, perhaps, he is just "no good". However, science has made it possible for us to answer some of these questions. In the first place, scientists and doctors have found that games make for better mental outlook on life. If a fellow knows the rules for one particular game, he should make it his duty to find out something about other games. This teaches one to become broad-minded, so to speak, and enables him to have a general respect for all people. If a person wishes to become a doctor or a lawyer, he is, naturally, interested in that one line, but he should make it his business to become interested in other professions. The fellow that is disliked more than anyone is the fellow that fails to be an "all-round chap". He is the person that gradually becomes very timid and shy and doesn't like to partake with others at games or dances. Our modern age, I think, has made it possible for all boys and girls to get the most out of life. By reading books and meeting people, we can, I believe, get to like others more and thus be far more appreciated by them.

Candidate #2638.

This Edmonton boy offers a very good solution for the problem, but does not give the required method.



ESSAY #358

Why Do Some People Seem To Dislike Me?

Why is it that some people seem to dislike me? Is there something wrong with me or something lacking? These are the first two questions I ask myself. Maybe my disposition is not cheerful enough and I am grouchy and disagreeable at times. If so, I must not drink coffee as this contains a substance called caffeine which makes you nervous and gives you sleepless nights. I must get more sleep as this rests the nerves and gives you a better mental state of mind. Have I got bad breath? This can be very offending to others, and if so I must see my dentist about it at once and find the cause as it may be bad teeth or even an upset stomach. Am I lively and do I take part in games and associate with other people? If not, I must eat more energetic foods to make me livelier and take part in games as most people do. Am I too shy or bashful? If so, I must get down to the essence of my faults and correct them. A good, clean and healthy state of mind and body also go a long way in making you more likeable to others. I am sure if I went about correcting my faults in a scientific manner, I would be a more agreeable person to associate with.

Candidate #3358.

This girl has given six reasons why people may dislike her and has gone about in a scientific way to correct them, yet she gets only two marks because she has not the Scientific Method.

ESSAY 651

Why Do Some People Seem To Dislike Me?

This thought has been bothering me for quite a while. Is it the people, or is there something wrong with me? It couldn't be my personal appearance because I always try to be clean and tidy. There must be something else, so don't say anything for a minute and let me think.

Am I considerate of others or do I only want myself to have a good time? Am I a good loser or do I sulk when some other person wins? Am I on time for engagements or do I keep people waiting? So far I don't think I am guilty of the second half of these questions, but there is still another one - Do I make friends easily? The answer is "No".

I am dreadfully shy. I am afraid to do anything that will make me visible to the public eye. Sometimes I would like to speak to that new girl at the other end of the hall, but I'm afraid she won't like me, since she looks rather proud and is much prettier than I am.

Here! this must stop! How do I think I will ever get through life if I don't conquer this foolishness? There's that girl again and she doesn't really look proud, probably she's only shy just like I am, so I will speak to her right away before I give myself time to become frightened.

Good-bye! Thank you so much for listening to my tale of woe.

Candidate #651.

TABLE XXVIII

No. of Students who answered in Essay form Question #5.				No. who Failed to answer Question.	No. who used Scientific Method.	Total N
Question#5	(a)	(b)	(c)			
Cities	110 73.33%	19 12.66%	7 4.66%	6 4%	8 5.33%	150
Towns & Villages	111 74%	15 10%	12 8%	4 2.66%	8 5.33%	150
Rural	123 82%	15 10%	6 4%	5 3.33%	1 2/3 of 1%	150
Total	344 76.44%	49 10.88%	25 5.55%	15 3.33%	17 3.77%	450 99.97%

92.9% of the students answered the question in Essay form.

TABLE XXIX

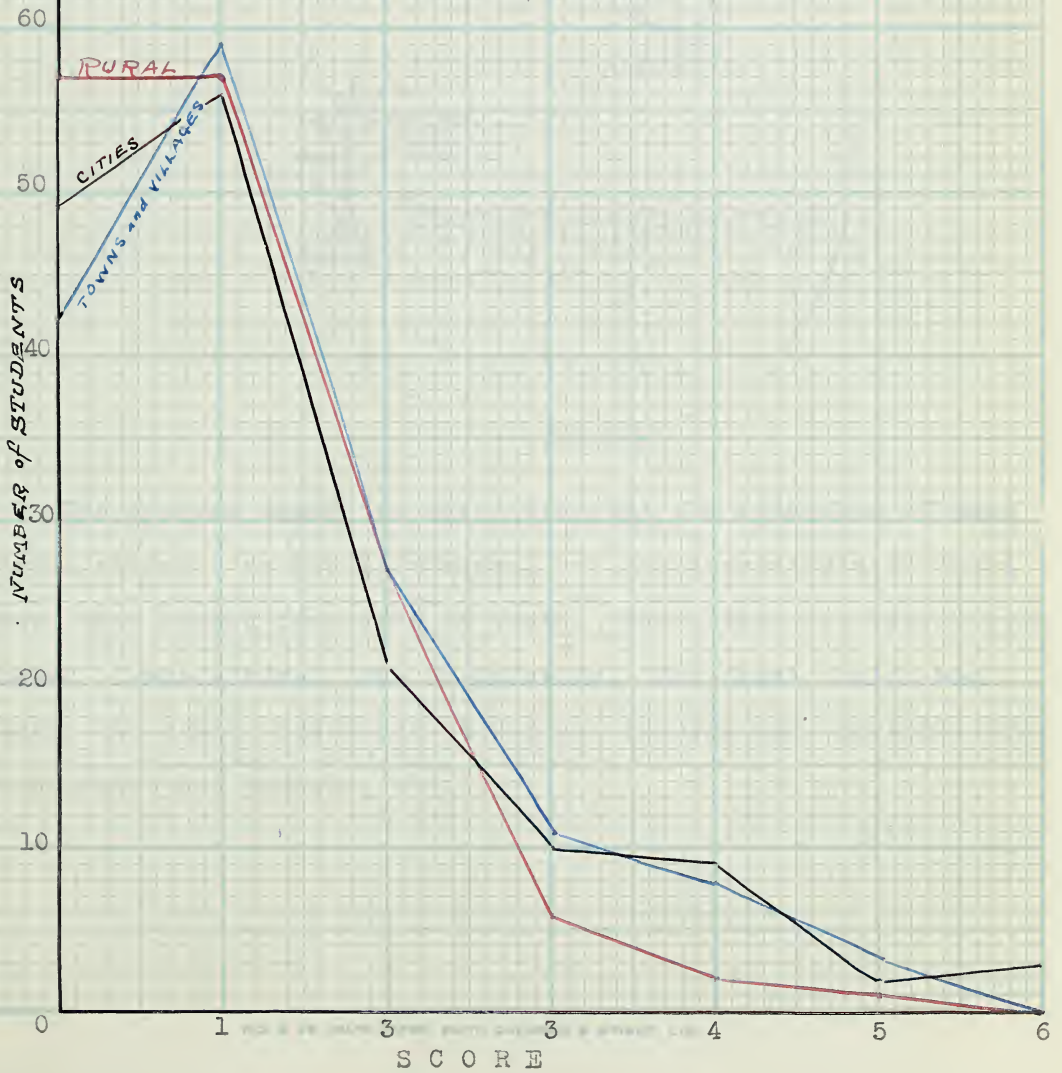
No. of Students Receiving the following Score:

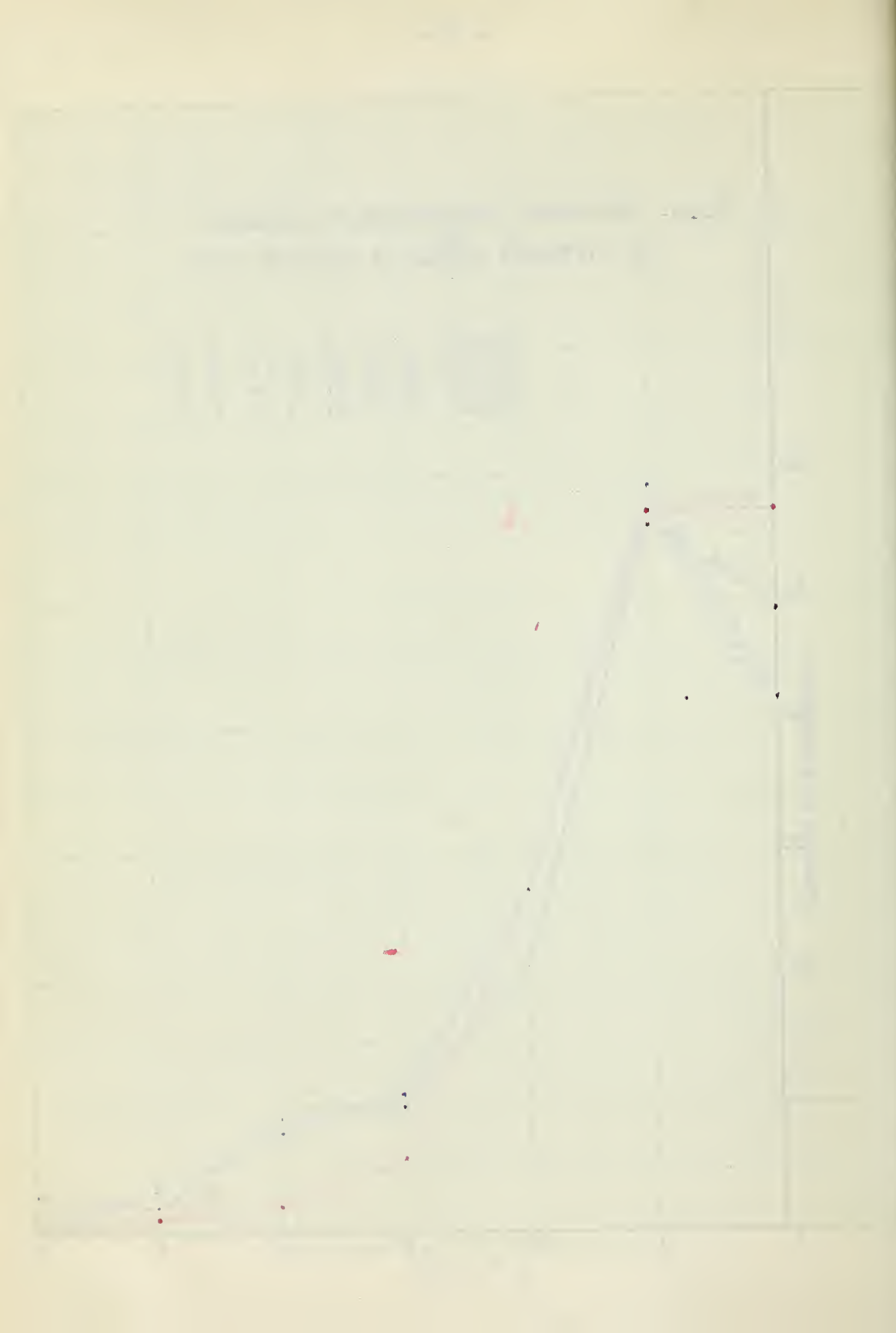
Score	0	1	2	3	4	5	6	Total
Cities	49 32.66%	56 35.33%	21 14%	10 6.66%	9 6%	2 1.33%	3 2%	150
Towns & Villages	42 28%	59 39.33%	27 18%	11 7.33%	8 5.33%	3 2%	0	150
Rural	57 38%	57 38%	27 18%	6 4%	2 1.33%	1 2/3 of 1%	0	150
Total	148 32.88%	172 38.22%	75 16.66%	27 6%	19 4.22%	6 1.33%	3 2/3 of 1%	450 99.97%

One-third of the students of the Province of Alberta received no marks for this question. A little more than a third received only one mark out of the six allotted for this question. One-sixth received only two marks, and only 2/3 of 1% of all the students received the total score of six.

Fig.14- FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION FIVE

Score	0	1	2	3	4	5	6
Cities	49	56	21	10	9	2	3
Towns	42	59	27	11	8	3	0
Rural	57	57	27	6	2	1	0





QUESTION SIX

Value

- 6 6. Show by three examples of each that the special
Either types of plants or animals developed in green
 regions are determined in large measure by the
 nature of the soil and the climate in those regions.
- Or Describe the "nitrogen cycle" by reference to this
 illustration.



The diagram seems to have attracted the attention of most of the students as Table XXX shows, but the scores obtained were poor, they ranged from zero to three. The Cities did better even though it was a rural type of question. The first choice was really the easier question; it did not require such chemical terms as nitrates and ammonia, etc.

ANSWERS TO QUESTION SIX

6. Either:

3 examples; 1 point each for soil adaptation;

1 " " " climate adaptation.

Plants and animals in struggle for existence adapt themselves to the physical conditions of their environment.

e.g. The cacti in desert areas have long penetrating roots to obtain scant moisture at considerable depths; reducing the leaf surface, the plant body is a juicy storehouse of moisture.

e.g. The conifers in northern temperate bushland; the shape is triangular to give body and strength in sandy soil. Reducing the leaf surface in form of needles and few stomata.

e.g. The tundra moss; shallow roots because soil does not thaw out deeply; moisture is scanty so foliage is not abundant.

e.g. Jungle foliage, etc.

6. Or: Any such good sequential treatment, as the following, should be accepted.

6 points for good explanation of the following stages:

1. Green plant eaten as food by animals.
2. Animal: wastes: death and decay: ammonified by bacteria and passes to soil.
3. Nitrifiers change ammonia materials to nitrates which are insoluble and useless to plants.
4. Nitrogen-fixers on nodules of legumes convert nitrates to soluble nitrates.
5. Nitrates taken into plants and built up as protein or nitrogen content.
6. Protein food taken by humans and animals.
7. Plant decays and the cycle continues.
8. Soil bacteria require air and breathe free nitrogen.

TABLE X XX

FREQUENCY DISTRIBUTION OF STUDENTS
for
QUESTION SIX

(a) represents the first choice.

(b) " " "nitrogen cycle", the second choice.

Score	Number of Students out of 150.					
	Cities		Towns and Villages		Rural Districts	
0	43 or 28.67% (a)	(b)	54 or 36% (a)	(b)	50 or 33.33% (a)	(b)
1	5	18	7	26	5	20
2	6	19	2	28	7	29
3	6	20	7	9	8	13
4	3	4	2	4	3	3
5	4	10	2	3	4	6
6	2	10	1	4	0	3

TABLE XXXI

FREQUENCY DISTRIBUTION OF STUDENTS
for
QUESTION SIX

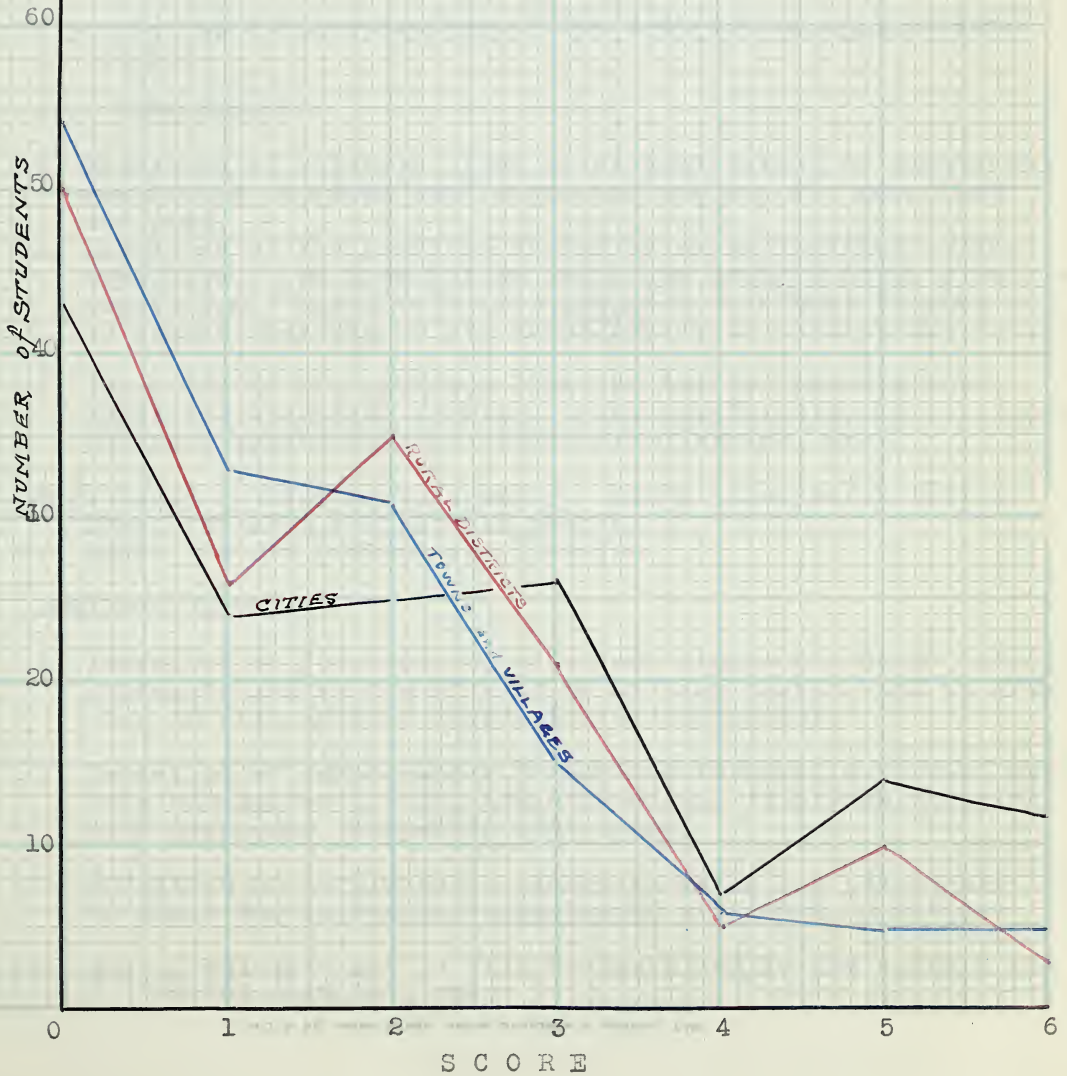
	For Both Parts (a) and (b).						
Score	0	1	2	3	4	5	6
Cities	43	24	25	26	7	14	12
Towns & Villages	54	33	31	15	6	5	5
Rural Districts	50	26	35	21	5	10	3

Each frequency is out of 150; for instance in the Cities twelve students out of 150 obtained a score of six, and 43 or 28.67% had a score of zero.

The Towns and Villages and the Rural Districts did considerably worse on this particular type of question that has a rural atmosphere about it.

Fig.15-FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION SIX

Score	0	1	2	3	4	5	6
Cities	43	24	25	26	7	14	12
Towns	54	33	31	15	6	5	5
Rural	50	26	35	21	5	10	3



THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT



QUESTION SEVEN

Value

- 6 7. Discuss the following statement:
Either " The principles of Science may be used for improving and enriching the common life, but they may also be used in ways that are destructive."

Or: Can Science be said to be responsible for economic depression?

ANSWERS

7. Either

3 points for 3 illustrations of the "improvement-applications" of science.

3 points for 3 illustrations of the destructive applications of science.

e.g. IMPROVEMENTS:

1. Invention of electric light as an application of electrical resistance in wires has lengthened the day for more work and play.
2. Invention of the gasoline engine as an application of the expansive force from burned fuels has brought about a mobile population. Rural folk thus get to town ^{more} often to shop and to attend theatres or get about easily to parties and dances.
3. Invention of big machines like the tractor permits more rapid and extensive farming; thus more leisure, more revenue, and more opportunity to retire from farming. etc.

e.g. X-Ray in health: Telegraphy - hasty messages: Printing Press for more enlightened people.
Radio - world news at our fireside.

DESTRUCTIVENESS:

1. Invention of gunpowder to blast out stumps and make bridge abutments led to use of guns in killing people, and in killing of wild animals (depletion of resources).
2. Invention of compressed air machines for drills carried over into submarines (rising and descending) to attack shipping with torpedoes (propellor and screw).
3. Invention of airplanes to transport mails and passengers led to their use in bombing unprotected civilians in cities.
4. Use of chlorine gas to kill bacteria led to gas warfare and 'masked mortals'. etc.

ANSWERS TO QUESTION SEVEN (Continued)

7. Or:

3 points for defence of Science.

3 points for factors outside of Science proper which cause depressions.

Or: 6 points for good arguments showing that Science causes depressions (tied up with the Science of the Industrial Revolution and resulting machines.)

Science invents machines and labor-saving devices, which put men out of work. Science can hardly be blamed because society cannot plan for shorter hours, and work for all. Science devises machines for mass production but government should modify the machinery of control so as not to hamper Science. Scientific achievement and invention, far from causing depressions, continue in the midst of depressions, even in war time; science research goes on internationally. Science cannot turn back, but rather it will continue to show man the way to greater and greater achievements.

Money control, the tightening and loosening of credit, causes depressions; Science does not take the responsibility for these matters. Wars too are generally followed by depressions; nor can it be said that wars are the result of Science.

The second choice of question seven goes beyond the work of Science and is much more difficult than the first statement; as a result most of the candidates, who attempted this question, chose the first one. The results, however, should have been much better than Table XXXII shows.

TABLE XXXII

FREQUENCY DISTRIBUTION OF STUDENTS for QUESTION SEVEN

Score	0	1	2	3	4	5	6
Cities	25	6	24	20	35	24	15
Towns and Villages	25	13	21	27	26	30	8
Rural Districts	28	19	26	31	23	9	14

Fig. 16- FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION SEVEN

Score	0	1	2	3	4	5	6
Cities	25	6	24	20	35	24	15
Towns	23	13	21	27	26	30	8
Rural	28	19	26	31	23	9	14

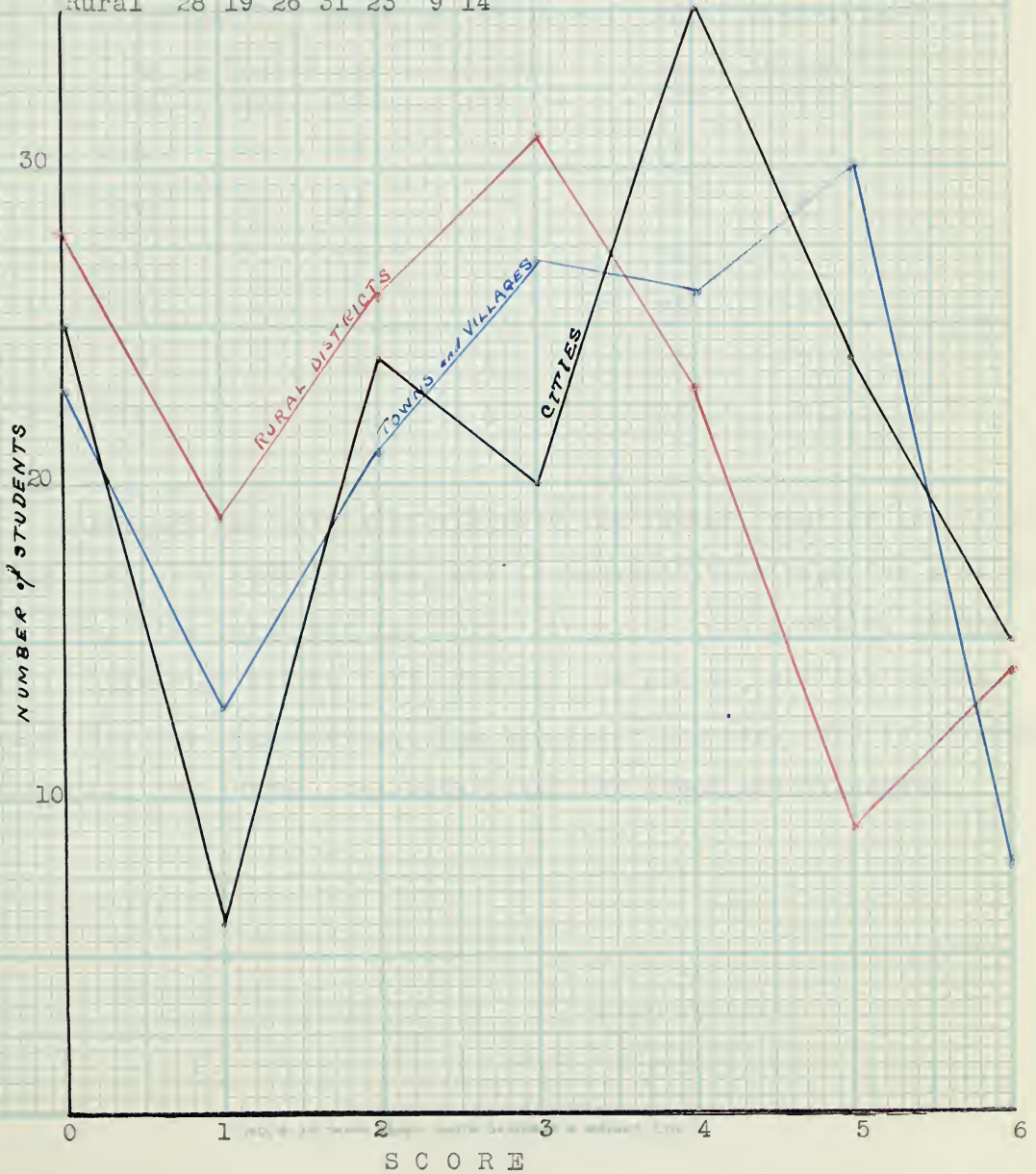


TABLE XXXIII
FREQUENCY DISTRIBUTION OF STUDENTS
for
QUESTION SEVEN

(a) Represents the first choice.

(b) " " second choice.

Score	Number of Students out of 150 in each of the three groups.					
	Cities		Towns and Villages		Rural Districts	
0	25 or 16.67% (a)	(b)	25 or 16.67% (a)	(b)	28 or 18.67% (a)	(b)
1	3	3	8	5	12	7
2	19	5	14	7	20	6
3	16	4	23	4	29	2
4	33	0	25	1	22	1
5	23	0	28	2	7	2
6	14	1	8	0	14	0

Although the curves in Figure 16 are jagged, that of the Cities sags low for a score of one, and is comparatively high for a score of four. The curve for the Rural Districts runs opposite to this: it is quite high at the left, for the low scores, and low to the right for the high scores. The trend for the Blue Line is between the other two curves, characteristic for Towns and Villages.

CHAPTER V

SHORT ANSWER QUESTIONS IN GENERAL SCIENCE

Questions eight and nine require the application of scientific principles studied earlier. Here again many of the students failed to see the principles involved. Question eight was quite poorly answered, probably because the question is different from those found in a textbook. It is apparent that students do not like questions which require thought and statements that are to be expressed in their own words. It is much more difficult to give such answers than to choose one of several answers, in fact it is just about as difficult as the planning and organization of an answer in Question Six.

The results of Question Nine are better than those for Eight, but they should have been much better, because the questions of the different parts are very easy. It seems that our students are not able to express themselves even in a limited way. This is an indication that our students are not accustomed to making their own reports in their own words. The author knows that much of the work done by the students is simply copied from a book or from another student.

QUESTION EIGHT
with
ANSWERS

Value

18 8. Directions:

Explain the following using short answers.

(a) Why the shadow of a tree resembles the tree in shape.

Answer.

2

Because light travels in straight lines, the sun's
.....
rays make a pattern of the tree on the ground.
.....

(b) Why a gasoline engine is provided with a flywheel.

Answer.

2

The weight (mass) of the wheel maintains smooth running
.....
performance without shock. Momentum is dependent on
.....
mass and speed. When the engine speeds up the fly-
.....
wheel tends to preserve speed and requires less power;
.....
again it prevents the engine from 'running away' if the
.....
machine is unloaded.
.....

(c) Why steam pipes are covered with asbestos.

Answer.

2

Asbestos is a poor conductor of heat; thus heat of steam
.....
does not escape - result is cheaper operation of furnace
.....
due to smaller fuel requirements.
.....

(d) Why a flash of lightning is seen before thunder is heard.

Answer.

2

Light travels 186,000 miles per sec.; sound travels
.....
1100 feet per sec. Light travels much faster than sound;
.....
thus light from the electric explosion reaches us almost
.....
instantaneously; the sound vibration lags behind because
.....
of the lower speed of travel.
.....

- (e) Why two holes are punched at opposite sides on the top of a can of evaporated milk.

Answer. This permits air pressure to enter and act on the top of
2 the liquid thus equalizing the air pressure which rushes into the lower opening. This allows gravity to do its work unhampered. OR: To let air in at the top and eliminate the "void". When the void exists the air presses into the lower hole and prevents fluid from running out.

- (f) Why water flows 'uphill' through one arm of a siphon.

Answer. The air pressure is practically the same on both surfaces
2 in the upper and lower vessels. The gravity pull on the longer column is greater than on the short column. Thus air pressure has the advantage on the surface of the higher vessel; it then forces the liquid uphill in the shorter arm.

- (g) Why air exhaled from the lungs differs in composition from inhaled air.

Answer. Inhaled air: fresh oxygen, nitrogen, .03% CO₂, inert
2 gases, water vapor, oxidation in lungs when oxygen acts on foods.
Exhaled air: oxygen is used up; the same nitrogen comes out; much larger per cent of CO₂ and of H₂O due to oxidation; the same inert gases make their exit.

- (h) A steel knife is magnetized and therefore can attract iron objects. The blade is then dissolved in strong sulphuric acid. Why is the solution not magnetic?

Answer. The magnetic theory states that the molecules are dis-
2 sociated and the alignment disturbed; thus the solution is non-magnetic; again the iron particles exist no longer as iron.

(i) Why do mountain climbers often suffer from nosebleed?

Answer. At high elevations, air pressure is considerably less.
 2 The pressure of the blood (heart) on the nose membranes,
 which are thin and exposed, is the same, while contra
 air pressure is less. Thus the heart presses blood
 through the exposed nasal membranes.

TABLE XXXIV

FREQUENCY DISTRIBUTION OF STUDENTS
 for
 QUESTION EIGHT
 For Its Different Parts.

Part. Number of Students out of 150 for each of the three groups

	Cities	Towns and Villages	Rural Districts
(a) Full			
Value	43 or 28.67%	51 or 34%	34 or 22.67%
Half			
Value	23 or 15.33%	18 or 12%	12 or 8%
(b) Full			
Value	32 or 21.33%	14 or 9.33%	13 or 8.67%
Half			
Value	15 or 10%	18 or 12%	21 or 14%
(c) Full			
Value	45 or 30%	21 or 14%	17 or 11.33%
Half			
Value	24 or 16%	21 or 14%	8 or 5.33%
(d) Full			
Value	110 or 73.33%	80 or 53.33%	77 or 51.33%
Half			
Value	4 or 2.67%	11 or 7.33%	10 or 6.67%
(e) Full			
Value	41 or 27.33%	23 or 15.33%	11 or 7.33%
Half			
Value	58 or 38.67%	73 or 48.67%	76 or 50.67%
(f) Full			
Value	30 or 20%	16 or 10.67%	13 or 8.67%
Half			
Value	65 or 43.33%	68 or 45.33%	65 or 43.33%
(g) Full			
Value	24 or 16%	14 or 9.33%	13 or 8.67%
Half			
Value	79 or 52.67%	87 or 58%	78 or 52%
(h) Full			
Value	26 or 17.33%	11 or 7.33%	5 or 3.33%
Half			
Value	32 or 21.33%	34 or 22.67%	27 or 18%

TABLE XXXIV(Continued)

Part	Cities	Towns and Villages	Rural Districts
(i) Full			
Value	46 or 30.67%	27 or 18%	19 or 12.67%
Half			
Value	42 or 28%	48 or 32%	45 or 30%

TABLE XXXV

FREQUENCY DISTRIBUTION OF STUDENTS

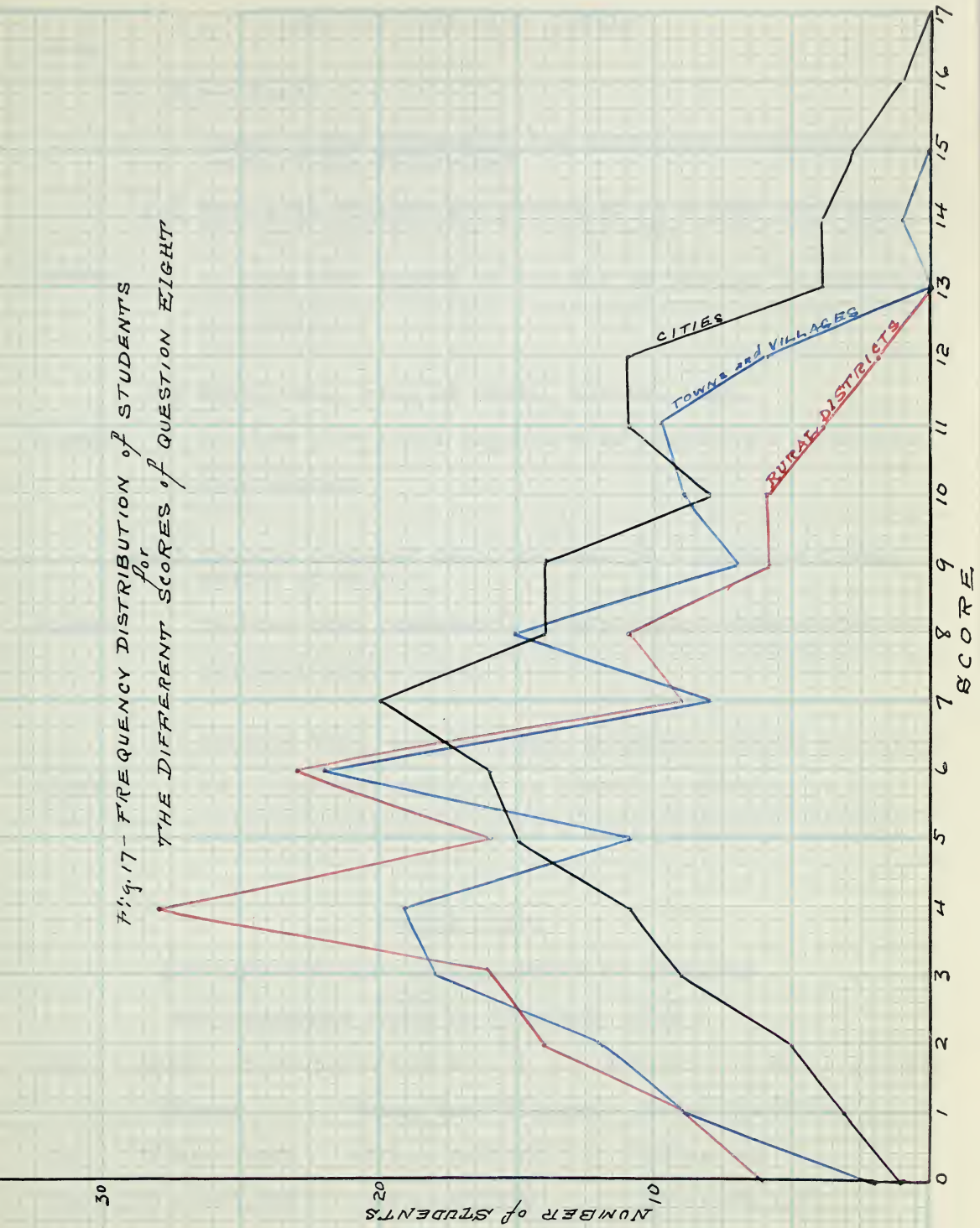
OF QUESTION EIGHT
for
THE DIFFERENT SCORES

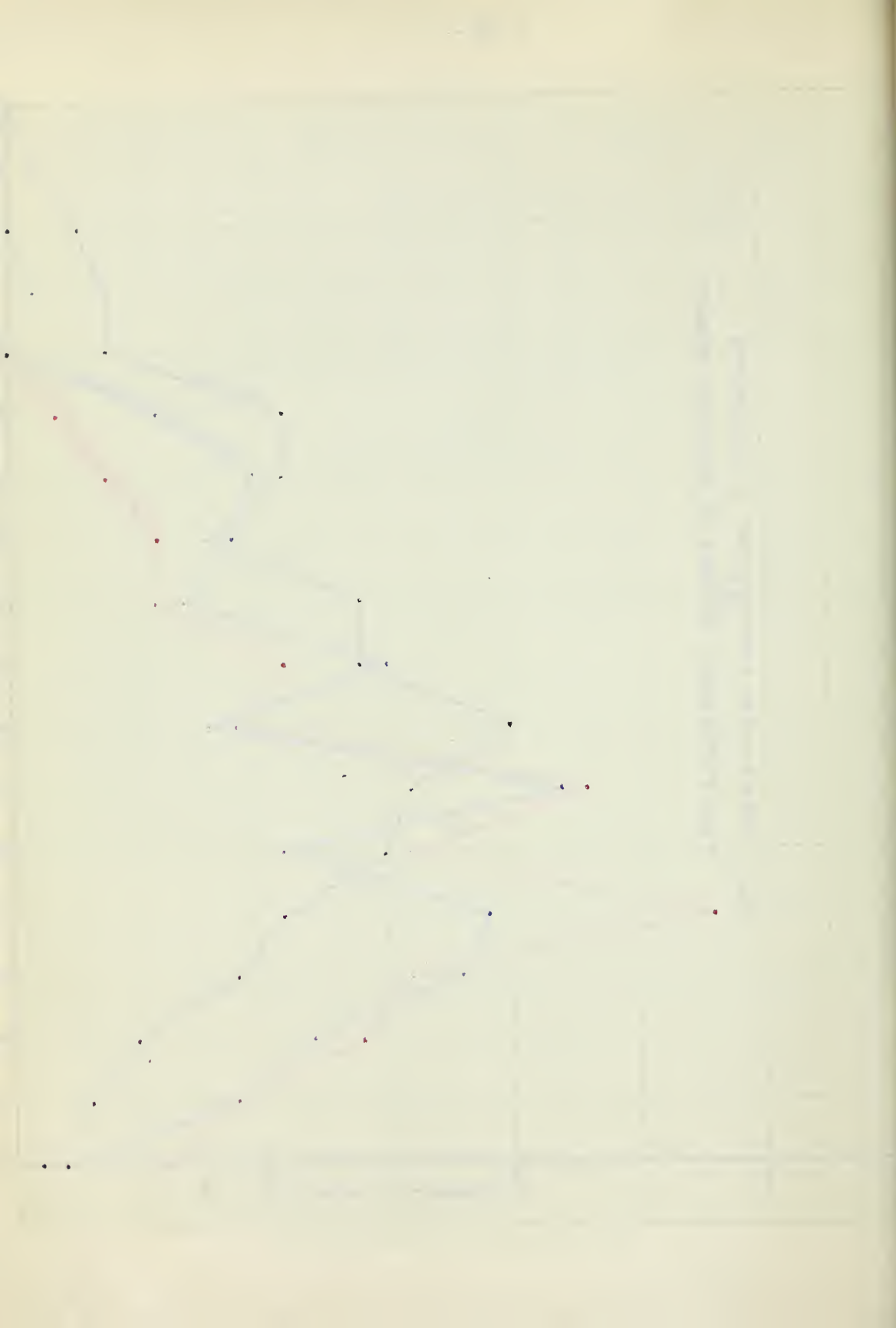
Score	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Cities	1	3	5	9	11	15	16	20	14	14	8	11	11	4	4	3	1	0
Towns & Villages	2	9	12	18	19	11	22	8	15	7	9	10	6	0	1	0	1	0
Rural	6	9	14	16	28	16	23	9	11	6	6	4	2	0	0	0	0	0

The curves of Figure are somewhat jagged, but they do show the tendencies very clearly; the Black Line of the Cities is low to the left and distinctly above the other two on the right; while the curve of the Rural Districts is very high for the low scores to the left and crosses that of the Cities at 6.4, then sinks quite rapidly to zero at the score of thirteen (13).

The tendency of the Blue Line, that of the Towns and Villages, is to lie somewhere between the Red and the Black.

Fig. 17- FREQUENCY DISTRIBUTION of STUDENTS
for
THE DIFFERENT SCORES of QUESTION EIGHT





QUESTION NINE with ANSWERS

Value

4 9. Directions:

What is the purpose of the experiment suggested by each of the following?

- (a) Some iron filings are sprinkled in a damp test tube. The test tube is then inverted over a dish of water.

Answer: To show that oxygen of the air is used up in oxidation
.....
or rusting.
.....

- (b) Metal ball, ring of metal, alcohol lamp.

Answer: To show that metal expands when heated and contracts
.....
when cooled.
.....

- (c) Balloon fastened over the neck of a Florence flask; source of heat.

Answer: To show that gases(and) or air expand when heated and
.....
contract when cooled.
.....

- (d) Thistle tube, egg membrane, molasses, beaker of water.

Answer: To illustrate osmosis, or osmotic pressure, or the
.....
passage of fluids through a semi-permeable membrane.
.....

TABLE XXXVI

DETAILED FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT PARTS OF QUESTION NINE

Part Number of Students out of 150 for each of the three groups.

	Cities	Towns and Villages	Rural Districts
(a)	73 or 48.67%	55 or 36.67%	36 or 24%
(b)	125 or 83.33%	98 or 65.33%	65 or 43.33%
(c)	88 or 58.67%	89 or 53.33%	78 or 52%
(d)	86 or 57.33%	73 or 48.67%	73 or 48.67%

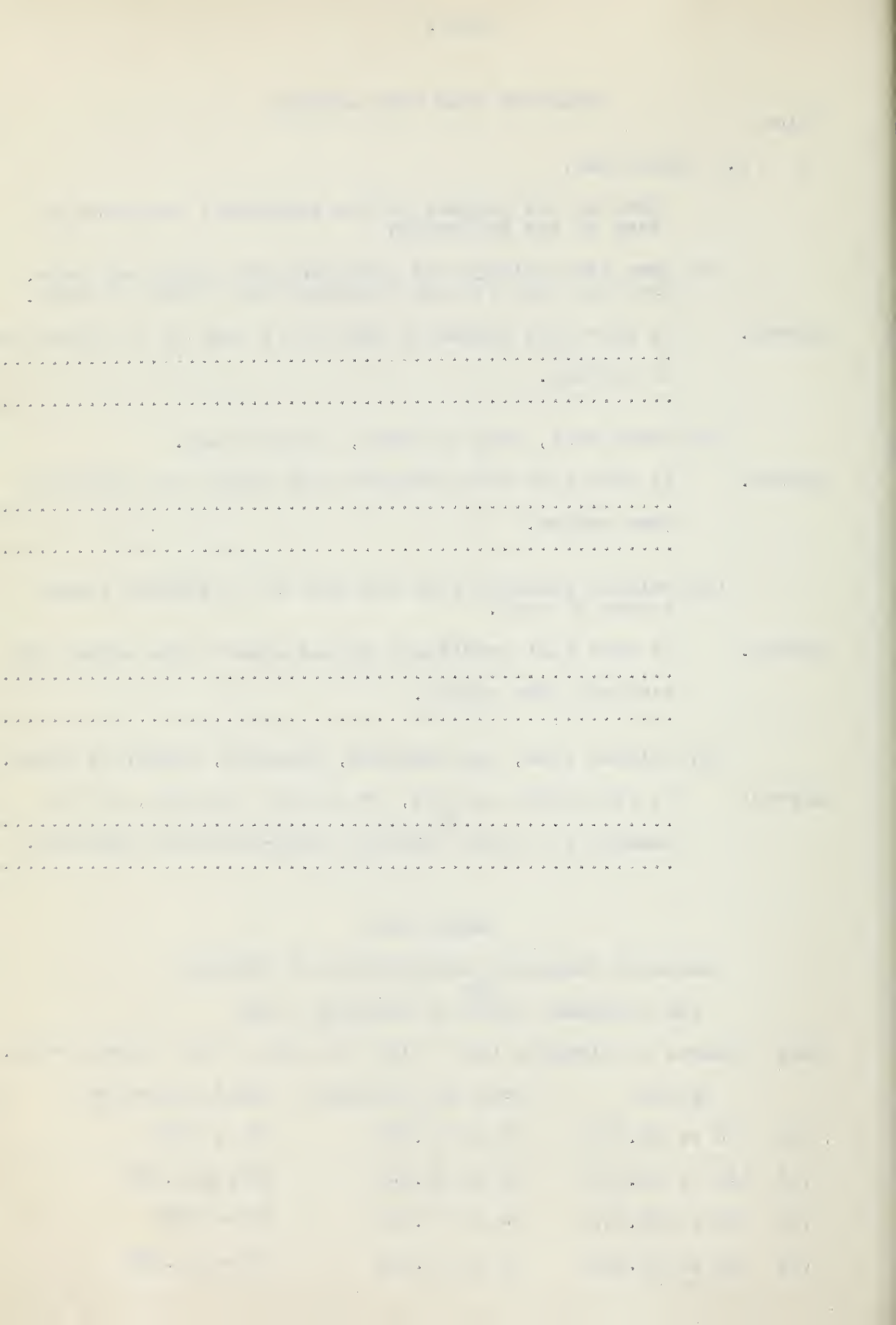
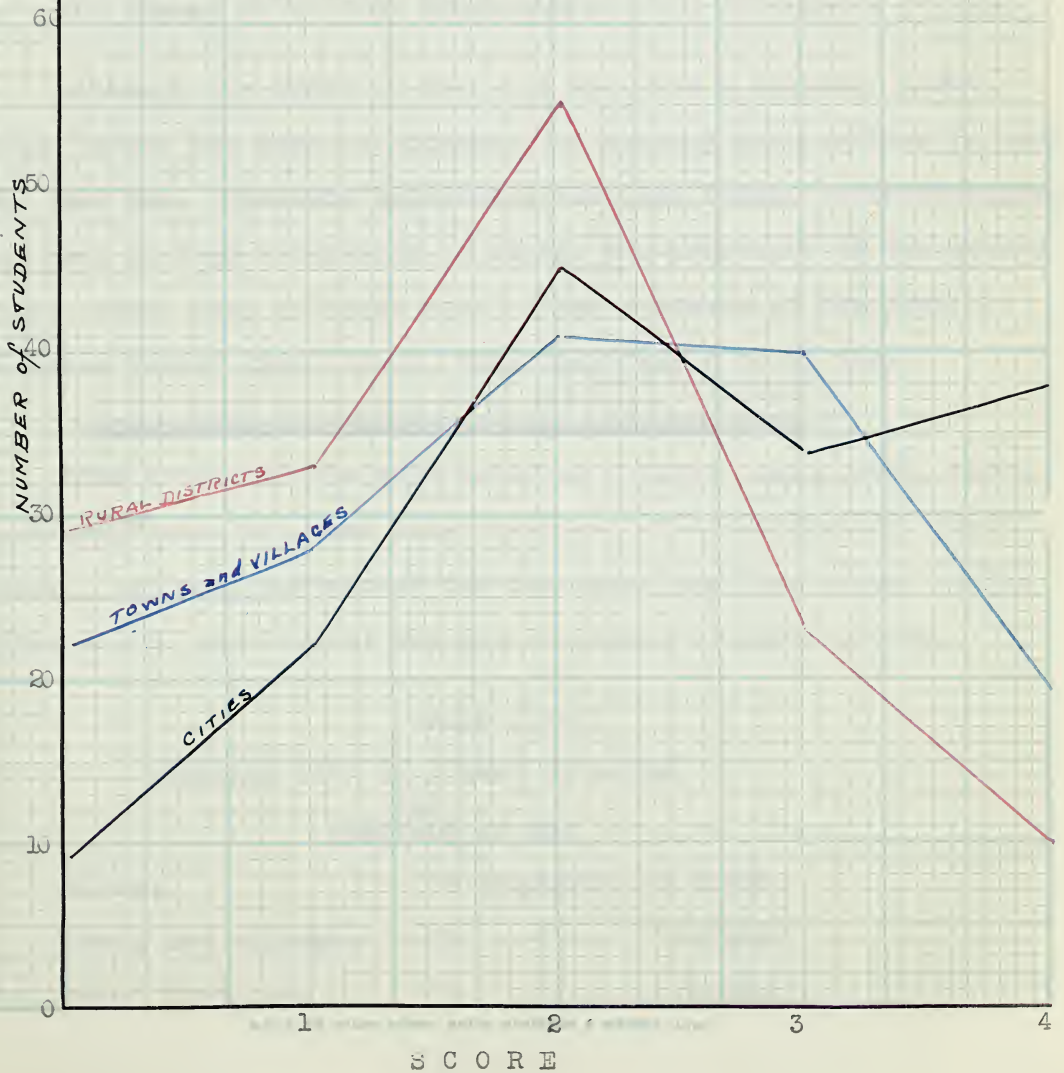
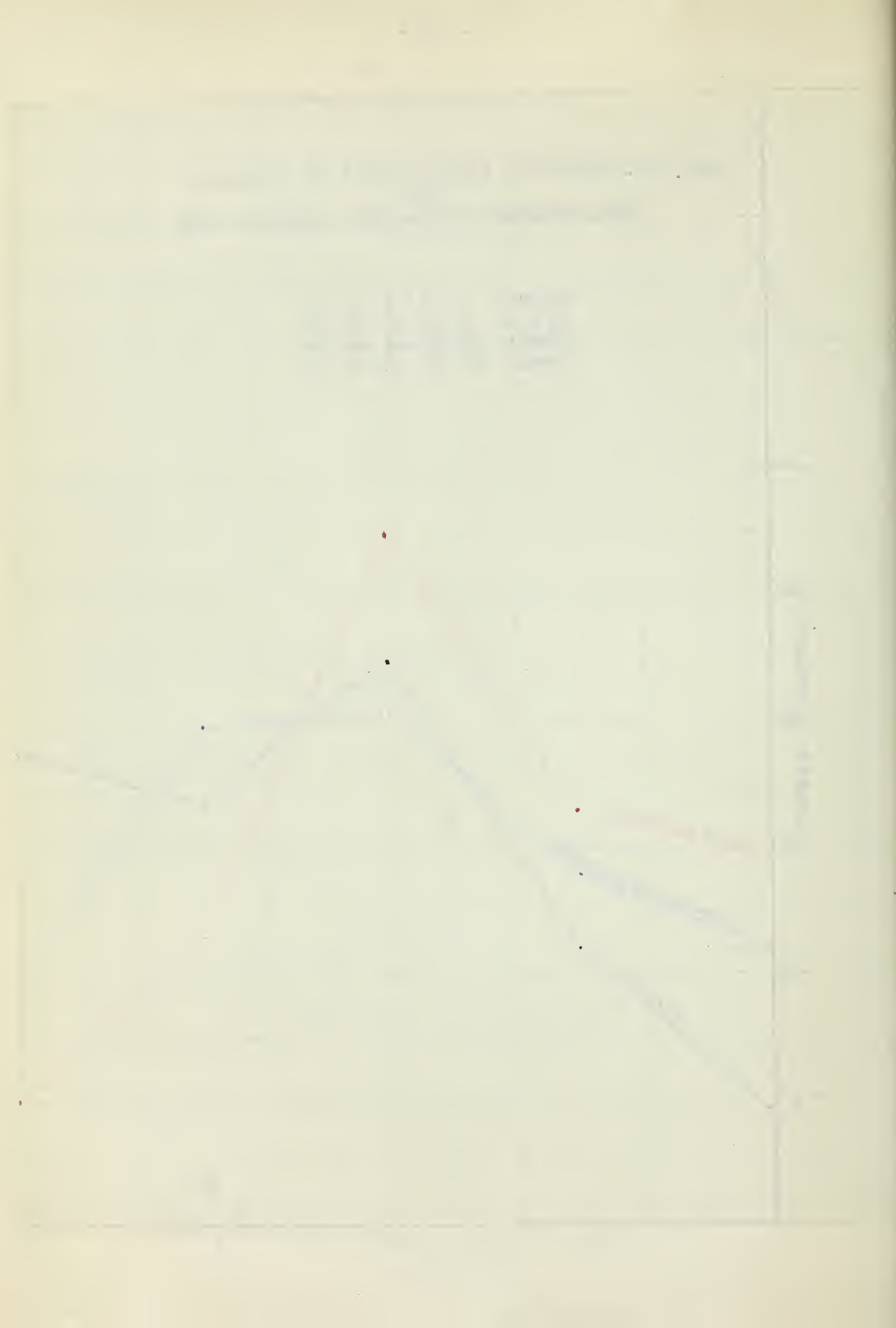


Fig. 18 - FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION NINE

Score	0	1	2	3	4
Cities	9	22	45	34	38
Towns	22	28	41	40	19
Rural	29	33	55	23	10





CHAPTER VI
MATHEMATICAL PROBLEMS

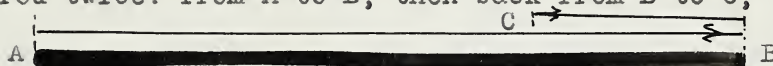
Question ten reads as follows:

10. Directions:

Solve the following problems, showing your work.

- (a) Jim exerts a squeeze of 15 pounds, five inches from the pivot of a nutcracker. The nut is one inch from the pivot. What is the crushing effect on the nut?
- (b) When Mary rides her bicycle she presses with a force of 20 pounds on the pedal of the pedal-crank. The crank is 9 inches long and the radius of the front sprocket is 4 inches. What is the greatest pull on the bicycle chain?
- (c) Change 68°F (room temperature) to a Centigrade reading.

Although the question does not call for a diagram, almost every person who made an attempt at solving the problems (a) and (b) used one. Students apparently had been taught to draw diagrams, but many of them had failed to master the principle of the second class lever; that at least part of the distance of the lever is measured twice: from A to B, then back from B to C, thus:



Some conceived the nutcracker as a first class lever, which is right, ^{for} there are some like that, and of course got the right answer, but many subtracted the one inch from five inches of the lever A - B, and in that way got an answer of sixty pounds.

TABLE XXXVII

STUDENTS WITH AN ANSWER OF 60lbs.
for
QUESTION 10 (a)

Cities	10	students, or 6.66%
Towns and Villages	11	" " 7.33%
Rural Districts	13	" " 8.66%

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TABLE XXXVIII

RESULTS OF QUESTION 10 (a)

No. of Students Who Answered This Part Correctly		
Cities	60	or 40%
Towns and Villages	51	" 34%
Rural Districts	40	" <u>25.33%</u>
Total	151	or 33.55% of the students for the Province.

This means that 60%, in the cities, did not answer this part of the question correctly; that 66% of the students in the towns and villages did not answer it correctly; and that 76.67% of the students of the rural districts failed to give the right answer.

The results for Question 10 (b) are worse: 69.34% of the students in the cities did not have the correct answer; in the towns and villages 64% of the students failed in this part of the question; in the rural districts 80.67% of the students failed in this one.

Question 10 (c) was still worse: 71.34% of the students in the cities either had an incorrect answer or omitted the question; 87.34% of the students in the towns and villages failed; and 91.34% of the students in the rural districts were unsuccessful. This means that only 8.66% of the students in the rural districts had the correct answer for part (c) of Question 10.

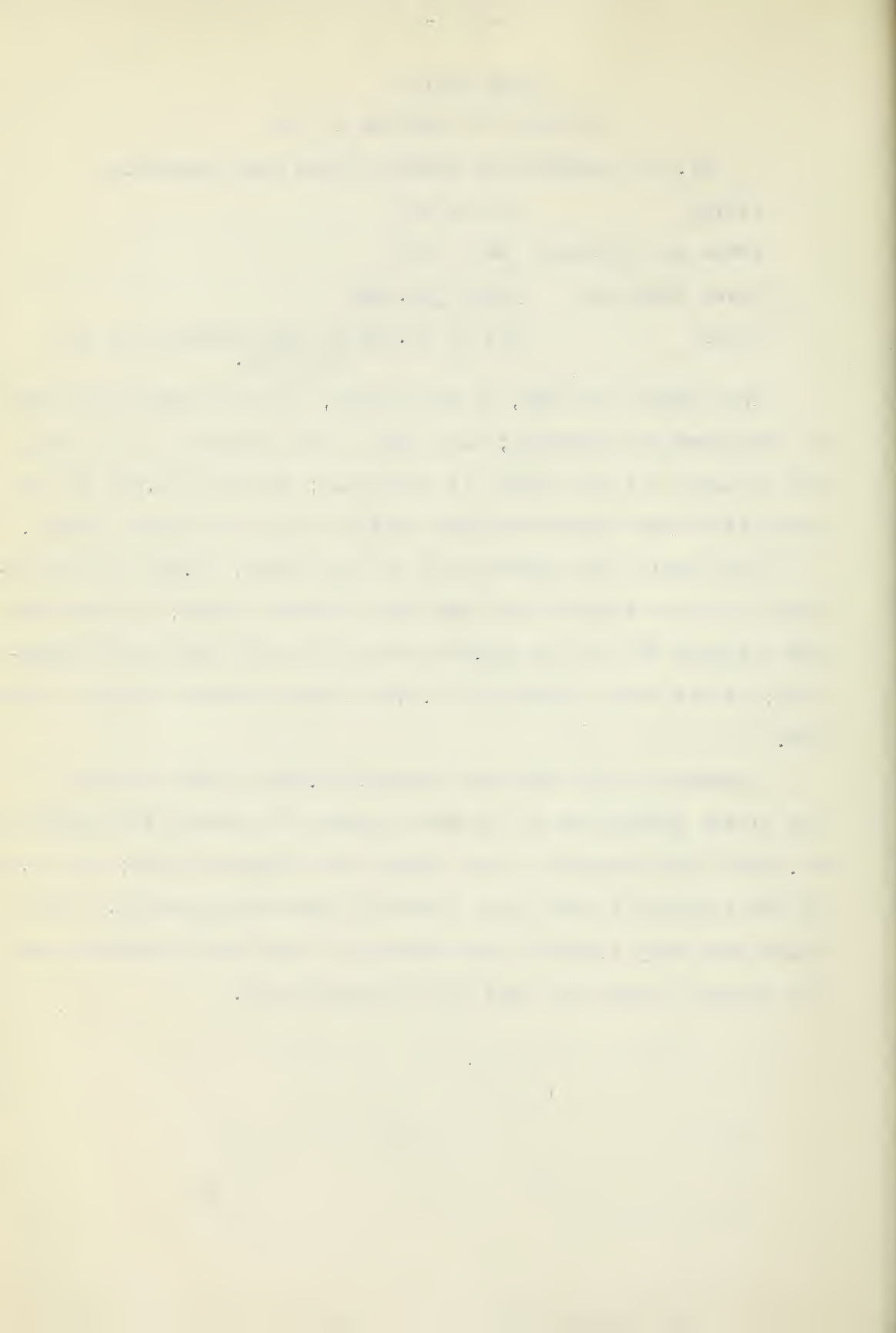


TABLE XXXIX

STUDENTS USING FOOT POUNDS as A UNIT
of
FORCE

Cities	7	or	4.66%	of the students.
Towns and Villages	4	or	2.66%	" "
Rural Districts	13	or	8.66%	" "

Several students confused the unit of force, pounds, with that of work, foot pounds. The rural students especially seem to be impressed with the idea of work, as the table above indicates; almost twice as many, in the country, used this unit.

For the purpose of analysis each part of question ten was divided into its four elements: first the diagram, which described the mental ^{picture} that the student had of the nutcracker and bicycle pedal; then the equation; thirdly the numerical answer; and finally the unit. As in the case of the diagrams, so with the unit, practically every one who made an attempt to solve the problem, had the correct unit, with the exception of those in TABLE ^{XXXIX} above.

The following table shows detailed results for Question 10 (a).
TABLE XL

RESULTS for QUESTION 10 (a)

SUCCESSFUL CITY STUDENTS

Diagram	83	or	55.33%	of the students.
Equation	83	"	55.33%	" " "
Numerical Answer	60	"	40%	" " "
Unit	106	"	70.66%	" " "

THE HISTORY OF THE
CITY OF BOSTON
FROM 1630 TO 1800

By
JOHN H. COOPER
Author of "The History of the City of New York"
New York: 1850

The history of the city of Boston, from its first settlement in 1630 to the present time, is a subject of great interest and importance. It is a city which has been the seat of many of the most important events in the history of the United States, and which has played a prominent part in the development of the nation. The city has been the birthplace of many of the most important political and social movements of the country, and has been the center of many of the most important intellectual and cultural activities of the nation. The history of the city is a history of the struggle for freedom and independence, and of the development of the principles of democracy and self-government. It is a history which is full of interest and excitement, and which is of great value to all who are interested in the history of the United States.

THE HISTORY OF THE CITY OF BOSTON	1
FROM 1630 TO 1800	1
By JOHN H. COOPER	1
Author of "The History of the City of New York"	1
New York: 1850	1

TOWNS AND VILLAGES

Diagram	69	or	46%	of	the	students.
Equation	75	"	50%	"	"	"
Numerical						
Answer	49	"	36%	"	"	"
Unit	98	"	66%	"	"	"

RURAL DISTRICTS

Diagram	47	or	31.33%	of	the	students.
Equation	51	"	34%	"	"	"
Numerical						
Answer	42	"	28%	"	"	"
Unit	80	"	53.33%	"	"	"

In the Cities, as the above table indicates, over fifty-five per cent of the students had the correct diagram and equation, but only forty per cent had the correct numerical answer. The Towns and Villages scaled about 10% lower in all these items. The Rural Districts are roughly 10% below the Towns and Villages. The number that had the correct unit was almost double that for the correct answer: 63.11% compared with 33.56%, as the following table shows:

TABLE XLI

DETAILED RESULTS FOR QUESTION 10 (a) for THE PROVINCE (Successful Students)

Diagram	199	or	44.44%	of	all	the	students.
Equation	209	"	46.44%	"	"	"	"
Numerical							
Answer	151	"	33.56%	"	"	"	"
Unit	284	"	63.11%	"	"	"	"

Summary of the work

Summary of the work done during the year 1900.

1. The first part of the work was devoted to the study of the

2. The second part of the work was devoted to the study of the

3. The third part of the work was devoted to the study of the

Summary of the work

Summary of the work done during the year 1901.

1. The first part of the work was devoted to the study of the

2. The second part of the work was devoted to the study of the

3. The third part of the work was devoted to the study of the

4. The fourth part of the work was devoted to the study of the

5. The fifth part of the work was devoted to the study of the

6. The sixth part of the work was devoted to the study of the

7. The seventh part of the work was devoted to the study of the

8. The eighth part of the work was devoted to the study of the

9. The ninth part of the work was devoted to the study of the

10. The tenth part of the work was devoted to the study of the

Some students simply divided 15 by 5 and obtained an answer of 3 pounds. These were distributed as follows:

TABLE XLII

NUMBER OF STUDENTS WHO HAD THREE POUNDS
for
AN ANSWER

Cities	14 or 9.33%
Towns and Villages	27 " 18%
Rural Districts	20 " 13.33%

Other students used poor algebra:

$$\text{e.g. } 15 \times 5 = R \times 1$$

$$75 = 1R \times 1$$

$$2R = 75$$

$$R = 37\frac{1}{2} \text{ lbs.}$$

TABLE XLIII

NUMBER OF STUDENTS USING POOR ALGEBRA

City Districts	3
Town and Village Districts	2
Rural Districts	<u>1</u>
Total	6 or 1.33% for the Province.

... ..
... ..

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... ..

Still other students used the 15 pound force twice:

$$15 \times 5 = 15 \times x$$

$$15x = 75$$

$$x = 5 \text{ lbs.}$$

These students were distributed as follows:

Cities	7	students.
Towns and Villages	3	"
Rural Districts	<u>5</u>	"
Total	15	" or 3.33% for the province.

In tabulating the scores, it was noted that certain marks appeared in groups: for example there were from two to ten zeros in certain groups. Another group would have a particular question. This indicated that certain schools had not taken up this type of work, while other schools had stressed only certain parts.

Question 10 (b) calls for an application of the same principle as in (a), namely the second class lever. Here are the results:

TABLE XLIV

RESULTS for QUESTION 10 (b)

Cities	46 or 30.66%	of the students.
Towns and Villages	54 or 36%	" " "
Rural Districts	<u>29 or 19.33%</u>	" " "
Total	129 or 28.66%	" " " of the province.

Those students who got both (a) and (b) were fewer yet. It was surprising that so many did not realize that the underlying principle of these two problems is the same.

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It is a well-known fact that the American Medical Association has been successful in its efforts to secure the highest quality of medical education and practice. This is due to the fact that the Association has been able to secure the cooperation of the medical profession and the public in its efforts to improve the quality of medical education and practice. The Association has been able to secure the cooperation of the medical profession and the public in its efforts to improve the quality of medical education and practice. The Association has been able to secure the cooperation of the medical profession and the public in its efforts to improve the quality of medical education and practice.

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TABLE XLV

STUDENTS with (a) and (b) ANSWERS
for
QUESTION 10

Cities	28 or 18.66%
Towns and Villages	27 " 18%
Rural Districts	<u>18 " 12%</u>
Total	73 " 16.22% for the whole province.

TABLE XLVI

ANALYTICAL RESULTS for QUESTION 10 (b)

SUCCESSFUL CITY STUDENTS

Diagram	41 or 27.33% of the students.
Equation	57 " 38% " " "
Numerical Answer	49 " 32.66% " " "
Unit	81 " 54% " " "

TOWNS AND VILLAGES

Diagram	25 or 16.66% of the students.
Equation	65 " 86.66% " " "
Numerical Answer	58 " 38.66% " " "
Unit	81 " 54% " " "

RURAL DISTRICTS

Diagrams	26 or 17.33% of the students.
Equation	42 " 28% " " "
Numerical Answer	38 " 25.33% " " "
Unit	60 " 40% " " "

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TABLE XLVII

DETAILED RESULTS FOR QUESTION 10 (b)
of
SUCCESSFUL STUDENTS OF THE PROVINCE

Diagram	92	or	20.44%
Equation	164	"	36.44%
Numerical Answer	145	"	32.22%
Unit	222	"	49.33%

The above results show that only half of the students who drew a diagram for 10 (a) (see Table XLI, page 89) drew one for 10 (b) also. There are only ten per cent less in 10(b) than in 10 (a) who have the right equation, and only one per cent less with the right numerical answer. There are, however, 13.8% students fewer in 10 (b) than 10 (a) with the right unit.

Tables XLI and XLVII show that about a third of the students of the Province have the correct numerical answer; only half of these students have both 10 (a) and 10 (b) correct as the total of Table XLV shows.

Question 10 (c) reads as follows:

Change 68°F (room temperature) to a Centigrade reading.

Here two ideas are involved: it is necessary to subtract 32° , then multiply by $100/180$ or $5/9$, the proportionate relationship between the two thermometer readings.

TABLE XLVIII

ANALYTICAL RESULTS OF QUESTION 10 (c)
SUCCESSFUL CITY STUDENTS

68 - 32.....	68	or	45.33%
5/9	74	"	49.33%
20°	44	"	29.33%
Unit.....	117	"	78%

TABLE XLVIII (Continued)

TOWNS AND VILLAGES (Successful Students)

68 - 32	49	or 32.66%
5/9	34	" 22.66%
20°	21	" 14%
Unit	87	" 58%

RURAL DISTRICTS

68 - 32	45	or 30%
5/9	24	" 16%
20°	15	" 10%
Unit	71	" 47.33%

The students in answering this question either did or did not remember the formula $5/9(F - 32) = C$, not one of them showed evidence of the underlying principle of the two scales, that in the Centigrade scale there are 100 divisions between the freezing and the boiling points, while in the Fahrenheit scale there are 180 divisions between the same two points; and that to change from Fahrenheit to Centigrade reading one must subtract 32° to bring the reading to the freezing point then reduce the reading by $100/180$ or $5/9$, and vice versa to change from Centigrade to Fahrenheit reading. In the last operation, the numerical value is increased by $180/100$ or $9/5$ and then add 32° .

The first item of Table XLVIII indicates many students who know that the freezing point of the Fahrenheit thermometer is 32° above zero. Several others also indicated the fact that the freezing point of the Centigrade thermometer is at zero degrees.

They also knew that the boiling point of the Fahrenheit thermometer is 212° , and that of the Centigrade is 100 degrees; yet they failed to see the relationship between these two thermometers, they failed to understand that these degrees are just so many divisions between the freezing and the boiling points. To them $5/9$ was just a number to be remembered. Some who did remember this number forgot to subtract thirty-two degrees.

Our textbooks are quite clear on this point, but they have no drill questions on the essential differences, which apparently are hard. Pupils by themselves do not seem to be able to master the principles, as the rural results show. The efficiency of the rural students is only 10% as compared with 29.33% of the cities. It is clear to the author that the students have missed the principle and have studied unrelated facts and numbers.

TABLE XLIX

FREQUENCY DISTRIBUTION
of
STUDENTS (Question 10)

Score	Cities	Total	Towns & Villages	Total	Rural Dist.	Total	Grand Total.
0	51	51	57	57	79	79	187
1.(a)	2		6		4		
(b)	3		3		6		
(c)	<u>1</u>	6	<u>2</u>	11	<u>1</u>	11	28
2.(a)	19		15		19		
(b)	10		22		11		
(c)	<u>16</u>	45	<u>9</u>	46	<u>7</u>	37	128
3.(a)	4		3		2		
(b)	2		3		2		
(c)	<u>1</u>	4	<u>0</u>	3	<u>2</u>	3	10
4.(a)	27		27		17		
(b)	24		25		18		
(c)	<u>15</u>	33	<u>6</u>	29	<u>3</u>	19	81
5.(a)	0		1		0		
(b)	1		1		0		
(c)	<u>1</u>	1	<u>1</u>	1	<u>0</u>	0	2
6.(a)	10		3		1		
(b)	10		3		1		
(c)	<u>10</u>	10	<u>3</u>	3	<u>1</u>	1	14
Total		150		150		150	450

ANNUAL REPORT

1890-1891

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1890	1	2	3	4	5	6	7	8	9	10	11	12	13
1891	14	15	16	17	18	19	20	21	22	23	24	25	26
1892	27	28	29	30	31	32	33	34	35	36	37	38	39
1893	40	41	42	43	44	45	46	47	48	49	50	51	52
1894	53	54	55	56	57	58	59	60	61	62	63	64	65
1895	66	67	68	69	70	71	72	73	74	75	76	77	78
1896	79	80	81	82	83	84	85	86	87	88	89	90	91
1897	92	93	94	95	96	97	98	99	100	101	102	103	104
1898	105	106	107	108	109	110	111	112	113	114	115	116	117
1899	118	119	120	121	122	123	124	125	126	127	128	129	130
1900	131	132	133	134	135	136	137	138	139	140	141	142	143
1901	144	145	146	147	148	149	150	151	152	153	154	155	156
1902	157	158	159	160	161	162	163	164	165	166	167	168	169
1903	170	171	172	173	174	175	176	177	178	179	180	181	182
1904	183	184	185	186	187	188	189	190	191	192	193	194	195
1905	196	197	198	199	200	201	202	203	204	205	206	207	208
1906	209	210	211	212	213	214	215	216	217	218	219	220	221
1907	222	223	224	225	226	227	228	229	230	231	232	233	234
1908	235	236	237	238	239	240	241	242	243	244	245	246	247
1909	248	249	250	251	252	253	254	255	256	257	258	259	260
1910	261	262	263	264	265	266	267	268	269	270	271	272	273
1911	274	275	276	277	278	279	280	281	282	283	284	285	286
1912	287	288	289	290	291	292	293	294	295	296	297	298	299
1913	300	301	302	303	304	305	306	307	308	309	310	311	312
1914	313	314	315	316	317	318	319	320	321	322	323	324	325
1915	326	327	328	329	330	331	332	333	334	335	336	337	338
1916	339	340	341	342	343	344	345	346	347	348	349	350	351
1917	352	353	354	355	356	357	358	359	360	361	362	363	364
1918	365	366	367	368	369	370	371	372	373	374	375	376	377
1919	378	379	380	381	382	383	384	385	386	387	388	389	390
1920	391	392	393	394	395	396	397	398	399	400	401	402	403
1921	404	405	406	407	408	409	410	411	412	413	414	415	416
1922	417	418	419	420	421	422	423	424	425	426	427	428	429
1923	430	431	432	433	434	435	436	437	438	439	440	441	442
1924	443	444	445	446	447	448	449	450	451	452	453	454	455
1925	456	457	458	459	460	461	462	463	464	465	466	467	468
1926	469	470	471	472	473	474	475	476	477	478	479	480	481
1927	482	483	484	485	486	487	488	489	490	491	492	493	494
1928	495	496	497	498	499	500	501	502	503	504	505	506	507
1929	508	509	510	511	512	513	514	515	516	517	518	519	520
1930	521	522	523	524	525	526	527	528	529	530	531	532	533
1931	534	535	536	537	538	539	540	541	542	543	544	545	546
1932	547	548	549	550	551	552	553	554	555	556	557	558	559
1933	560	561	562	563	564	565	566	567	568	569	570	571	572
1934	573	574	575	576	577	578	579	580	581	582	583	584	585
1935	586	587	588	589	590	591	592	593	594	595	596	597	598
1936	599	600	601	602	603	604	605	606	607	608	609	610	611
1937	612	613	614	615	616	617	618	619	620	621	622	623	624
1938	625	626	627	628	629	630	631	632	633	634	635	636	637
1939	638	639	640	641	642	643	644	645	646	647	648	649	650
1940	651	652	653	654	655	656	657	658	659	660	661	662	663
1941	664	665	666	667	668	669	670	671	672	673	674	675	676
1942	677	678	679	680	681	682	683	684	685	686	687	688	689
1943	690	691	692	693	694	695	696	697	698	699	700	701	702
1944	703	704	705	706	707	708	709	710	711	712	713	714	715
1945	716	717	718	719	720	721	722	723	724	725	726	727	728
1946	729	730	731	732	733	734	735	736	737	738	739	740	741
1947	742	743	744	745	746	747	748	749	750	751	752	753	754
1948	755	756	757	758	759	760	761	762	763	764	765	766	767
1949	768	769	770	771	772	773	774	775	776	777	778	779	780
1950	781	782	783	784	785	786	787	788	789	790	791	792	793
1951	794	795	796	797	798	799	800	801	802	803	804	805	806
1952	807	808	809	810	811	812	813	814	815	816	817	818	819
1953	820	821	822	823	824	825	826	827	828	829	830	831	832
1954	833	834	835	836	837	838	839	840	841	842	843	844	845
1955	846	847	848	849	850	851	852	853	854	855	856	857	858
1956	859	860	861	862	863	864	865	866	867	868	869	870	871
1957	872	873	874	875	876	877	878	879	880	881	882	883	884
1958	885	886	887	888	889	890	891	892	893	894	895	896	897
1959	898	899	900	901	902	903	904	905	906	907	908	909	910
1960	911	912	913	914	915	916	917	918	919	920	921	922	923
1961	924	925	926	927	928	929	930	931	932	933	934	935	936
1962	937	938	939	940	941	942	943	944	945	946	947	948	949
1963	950	951	952	953	954	955	956	957	958	959	960	961	962
1964	963	964	965	966	967	968	969	970	971	972	973	974	975
1965	976	977	978	979	980	981	982	983	984	985	986	987	988
1966	989	990	991	992	993	994	995	996	997	998	999	1000	1001
1967	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014
1968	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027
1969	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040
1970	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053
1971	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066
1972	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079
1973	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092
1974	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105
1975	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118
1976	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131
1977	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144
1978	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157
1979	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170
1980	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183
1981	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196
1982	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209
1983	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	1222
1984	1223	1224	1225	1226	1227	1228	1229	1230	1231	1232	1233	1234	1235
1985	1236	1237	1238	1239	1240	1241	1242	1243	1244	1245	1246	1247	1248
1986	1249	1250	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	1261
1987	1262	1263	1264	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274
1988	1275	1276	1277	1278	1279	1280	1281	1282	1283	1284	1285	1286	1287
1989	1288	1289	1290	1291	1292	1293	1294	1295	1296	1297	1298	1299	1300
1990	1301	1302	1303	13									

TABLE L

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT PARTS OF QUESTION TEN

Part Number of Students out of 150 for each of the three groups.

	Cities	Towns and Villages	Rural Districts
(a) Full			
Value	58 or 38.7%	48 or 32%	34 or 22.7%
Half			
Value	5 or 3.3%	9 or 6%	10 or 6.7%
(b) Full			
Value	46 or 30.7%	51 or 34%	28 or 18.7%
Half			
Value	4 or 2.7%	6 or 4%	11 or 7.3%
(c) Full			
Value	43 or 28.7%	19 or 12.7%	13 or 8.7%
Half			
Value	1 or 2/3%	4 or 2.7%	1 or 2/3 of 1%

TABLE LI

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION TEN

Score	0	1	2	3	4	5	6
Cities	51	6	46	3	33	1	10
Towns and Villages	57	10	45	4	30	1	3
Rural Districts	80	11	37	3	18	0	1

The zero scores are rather high for the above problems:

For the Cities we have 51 or 34%

Towns & V. " 57 or 38%

Rural " 80 or 53.3%

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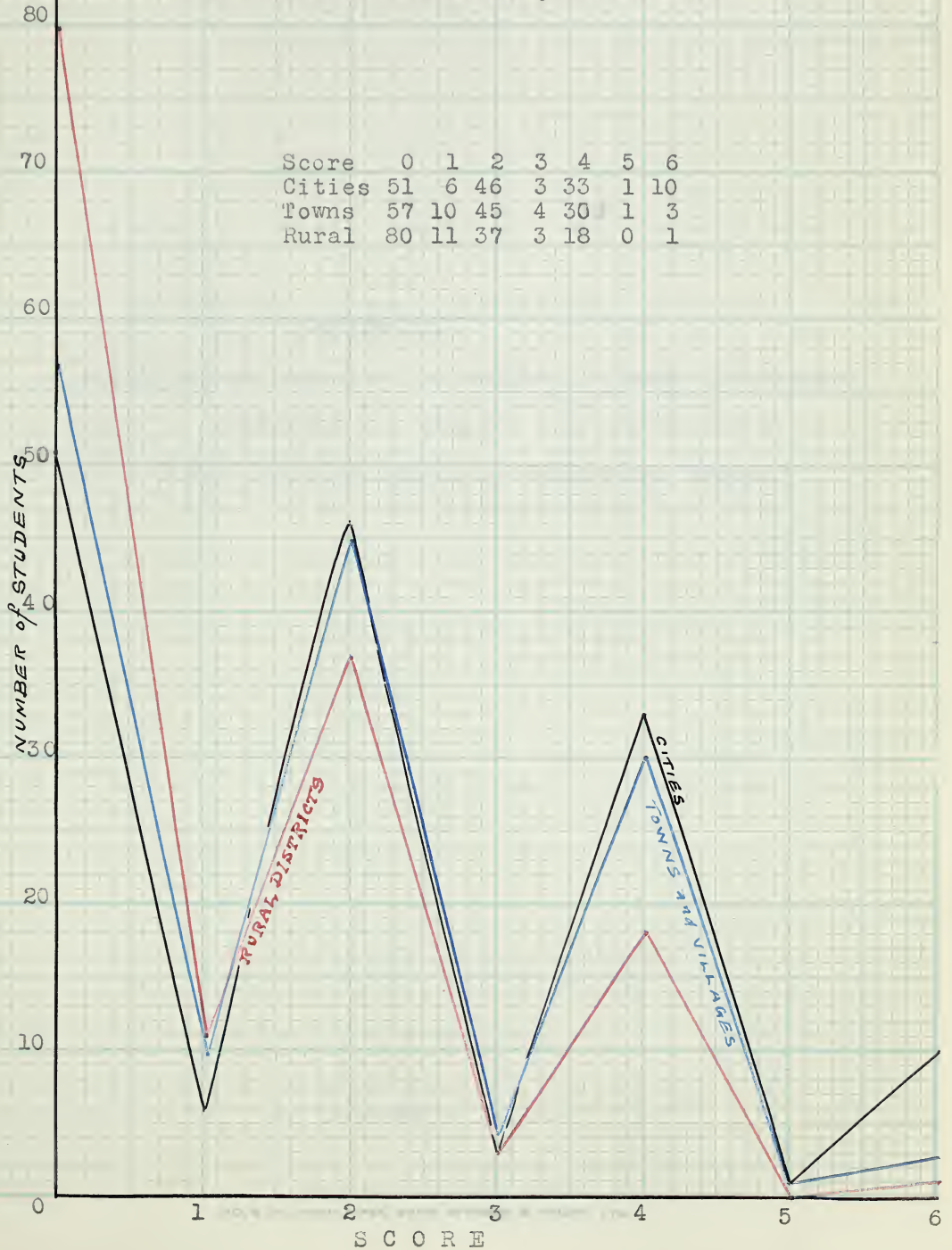
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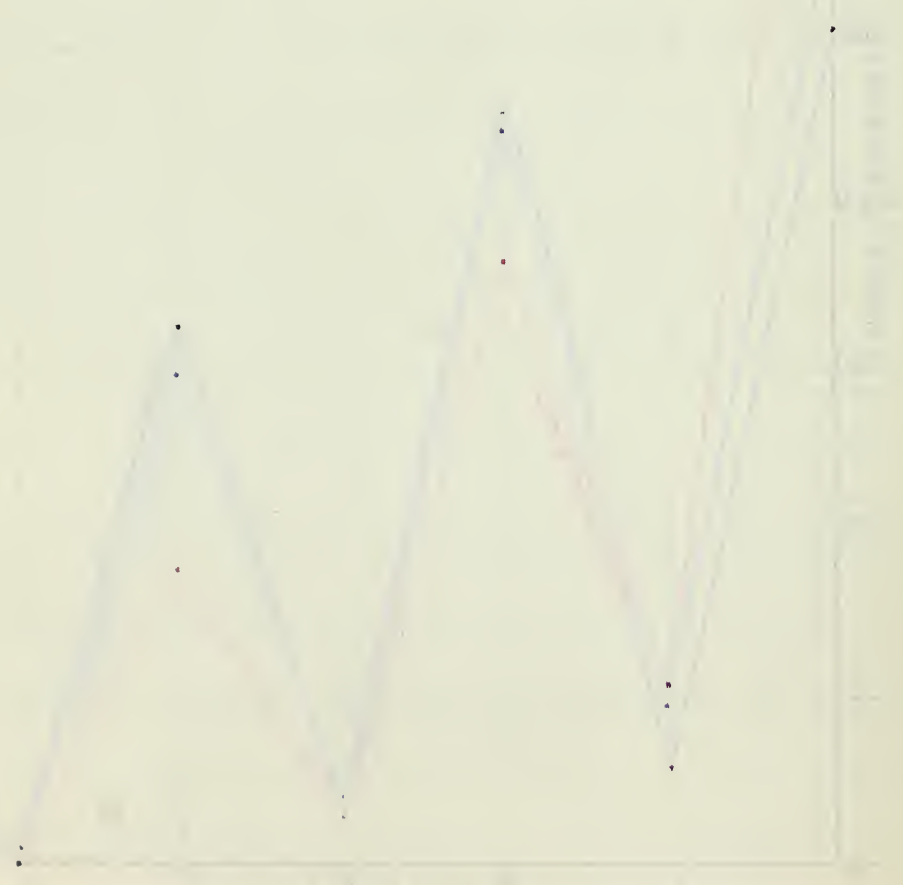
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Fig.19-FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION TEN



THEORY OF THE
EARTHQUAKE

THEORY



CHAPTER VII

SHORT ANSWER QUESTIONS IN GENERAL SCIENCE (Continued)

QUESTIONS 11, 12,,13, 14, 15, 16 and 17

W ith Answers, Frequency Tables and Graphs

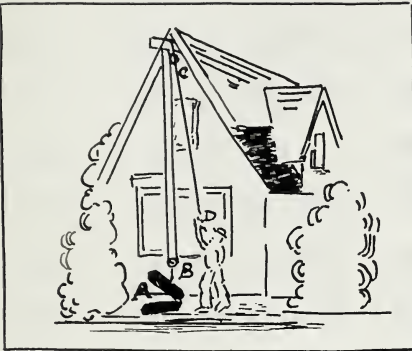
QUESTION ELEVEN

Value

with
ANSWERS

17 11. Directions:

In each pair of brackets at the right, place what has been omitted from the blank having the same number.



In the picture, the roll of roofing material A is being hoisted by means of a fixed pulley at...(1).. and a single movable pulley at...(2)...The force to do the work is exerted at...(3)...If the roll A weighs 100 pounds, then the least force that will lift it without the pulley system is...(4)...If the man stood at C and pulled up on the rope, the...(5).

1. (...C...)

2. (...B...)

3. (...D...)

4. (...100 lbs...)

5. (...Force...)

might be as small as...(6)...pounds, if there little... ..(7)...at B. When the

6. (...50 lbs...)

7. (...Friction...)

8. (...Down...)

man pulls ...(8)...at D,

more ...(9)...is required.

The friction at C is now

added to that at ...(10)...

The ...(11)...done in lift-

ing A, 20 feet, is ...(12)...

foot pounds. Work is al- Or 100 20

ways measured by the

.....(13).....

of

.....(14).....

and ...(15)... When the

load A moves 5 feet, the

...(16)... at D moves ...

...(17)...feet.

15. (...distance...)

16. (...rope...)

17. (...10...)

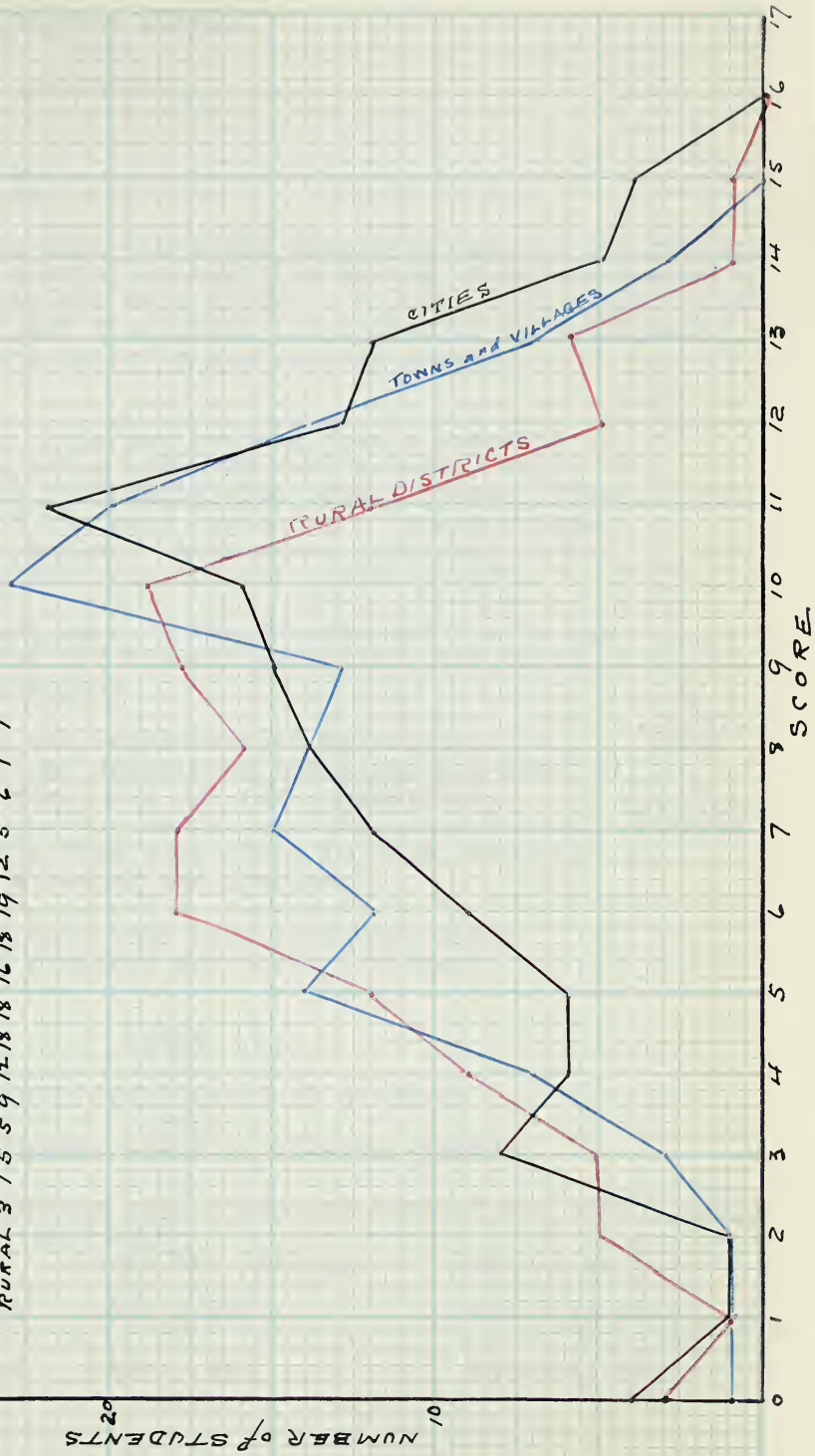
TABLE LII

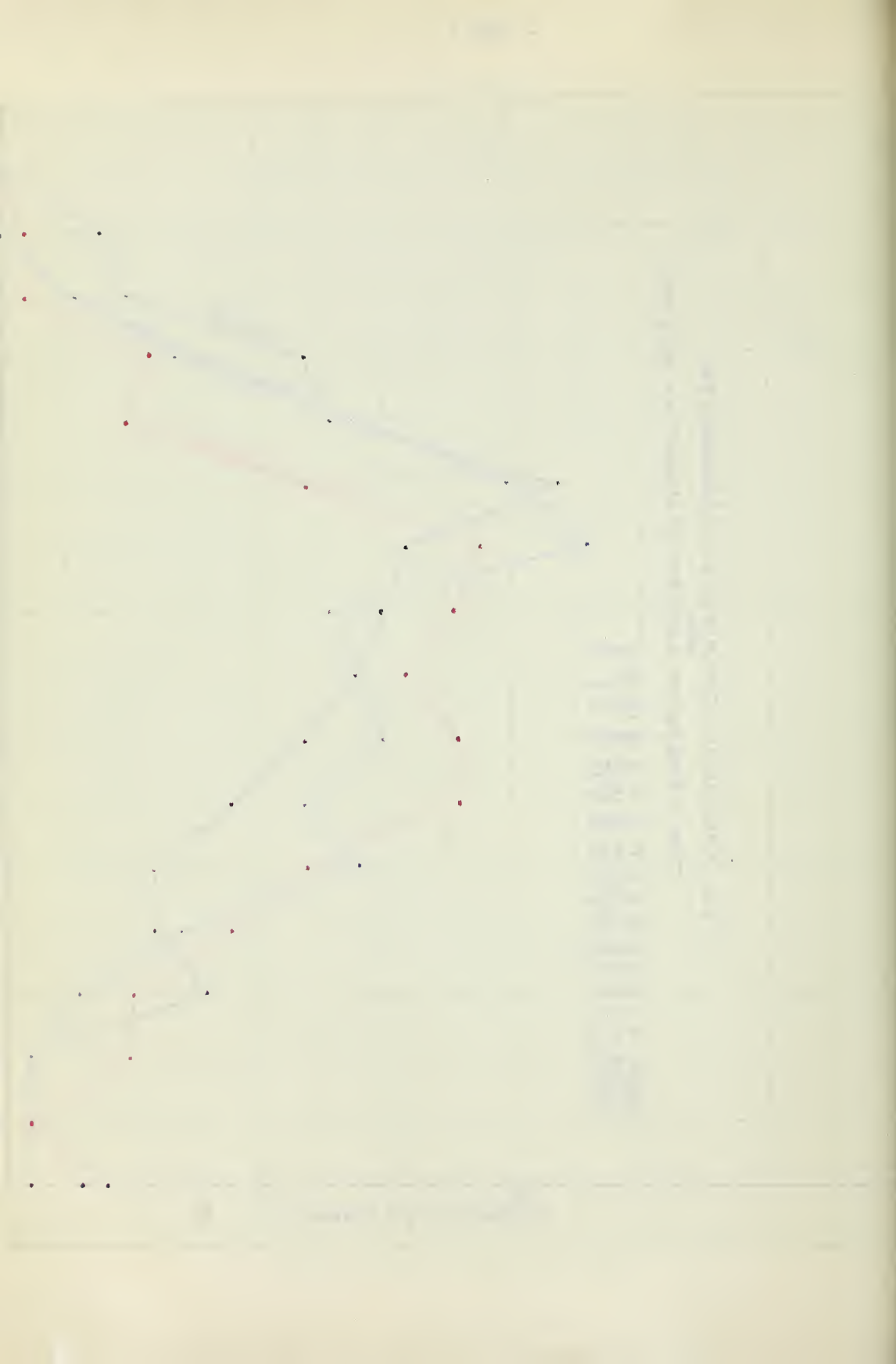
FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT PARTS OF QUESTION ELEVEN

Part	(Number of Students out of 150 for each of the three groups. (with correct answers)		
	Cities	Towns and Villages	Rural Districts
(1)	121 or 80.67%	127 or 84.67%	109 or 72.67%
(2)	119 or 79.33%	124 or 82.67%	105 or 70%
(3)	139 or 92.67%	142 or 94.67%	135 or 90%
(4)	103 or 68.67%	99 or 66%	75 or 50%
(5)	84 or 56%	64 or 42.67%	57 or 38%
(6)	80 or 53.33%	60 or 40%	66 or 44%
(7)	61 or 40.67%	48 or 32%	37 or 24.67%
(8)	71 or 47.33%	84 or 56%	71 or 47.33%
(9)	85 or 56.67%	86 or 57.33%	72 or 48%
(10)	110 or 73.33%	112 or 74.67%	104 or 69.33%
(11)	119 or 79.33%	112 or 74.67%	98 or 65.33%
(12)	37 or 24.67%	32 or 21.33%	32 or 21.33%
(13)	7 or 4.67%	7 or 4.67%	10 or 6.67%
(14)	12 or 8%	11 or 7.33%	17 or 11.33%
(15)	27 or 18%	17 or 11.33%	24 or 16%
(16)	100 or 66.67%	110 or 73.33%	82 or 54.67%
(17)	45 or 30%	56 or 37.33%	48 or 32%

Fig. 20 - FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION ELEVEN

SCORE	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CITIES	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TOWNS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RURAL	3	1	5	5	9	12	18	18	16	13	19	12	5	2	2	1





QUESTION TWELVE
with
Answers

Value

2 12. Directions:

Indicate what you think should be done in the problem below, writing on the line at the right the number of the statement that seems to be the best answer. Then on the next line write the number of the statement which you think is the poorest answer.

Situation: A farmer who had been successful in producing large crops of corn suddenly began to experience difficulty with insect pests. Other farmers in the same region were worrying with the same problem. Action was necessary. What would you have advised the farmer to do?

- (1) Collect some of the insects and try to determine for himself possible means of extermination.
- (2) Write the Department of Agriculture in Edmonton, describing the pests and how they work, and ask for suggestions.
- (3) Inquire from some other farmers how they have attacked the problem.
- (4) Refer to a text-book which describes plant diseases and their treatment.

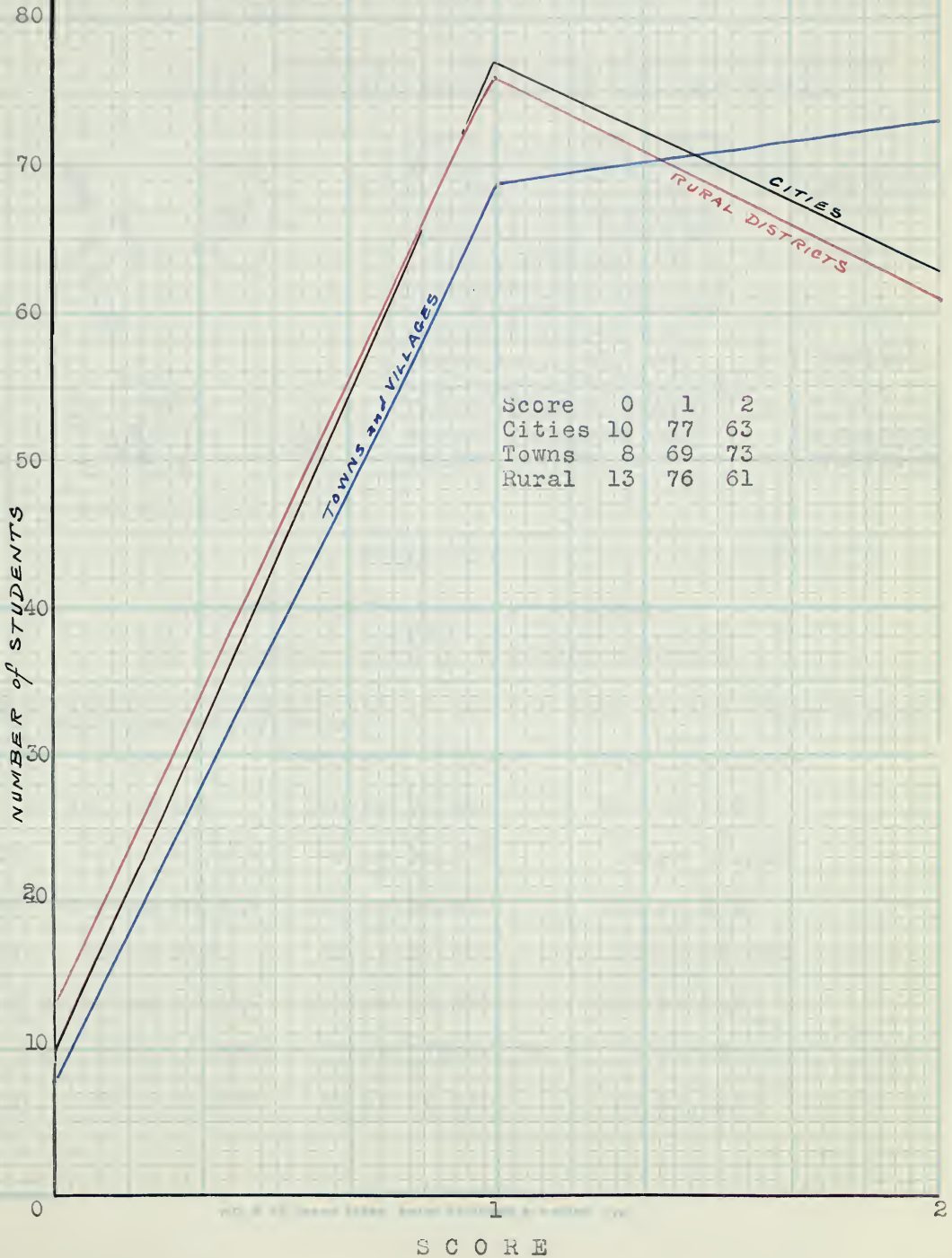
2
Best
1
Poorest

TABLE LIII

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT PARTS OF QUESTION TWELVE

Part	(Number of Students out of 150 for each of the three groups. (with correct answers)		
	Cities	Towns and Villages	Rural Districts
(1)	134 or 89.33%	138 or 92%	133 or 88.67%
(2)	70 or 46.67%	78 or 52%	65 or 43.33%

Fig.21- FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION TWELVE

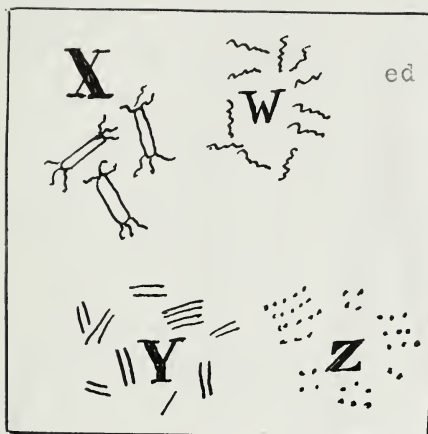


QUESTION THIRTEEN
with
ANSWERS

Value

7 13. Directions:

In the brackets at the right, place what has been omitted from the space having the same number.



ed

There are three common types of bacteria which are distinguished by their..(1)...The round or berry-shaped bacteria are known as ..(2)...and are represented by..(3)...in the diagram. The rod-shaped bacteria are known as...(4)..and are represented by..(5). The twisted or screw-shaped bacteria are called...(6)....

1.(shape(s))
or form
2.(cocci)
3.(...Z...)
4.(bacilli)
5.(...X, Y
(2 points)
6.(spirilla)

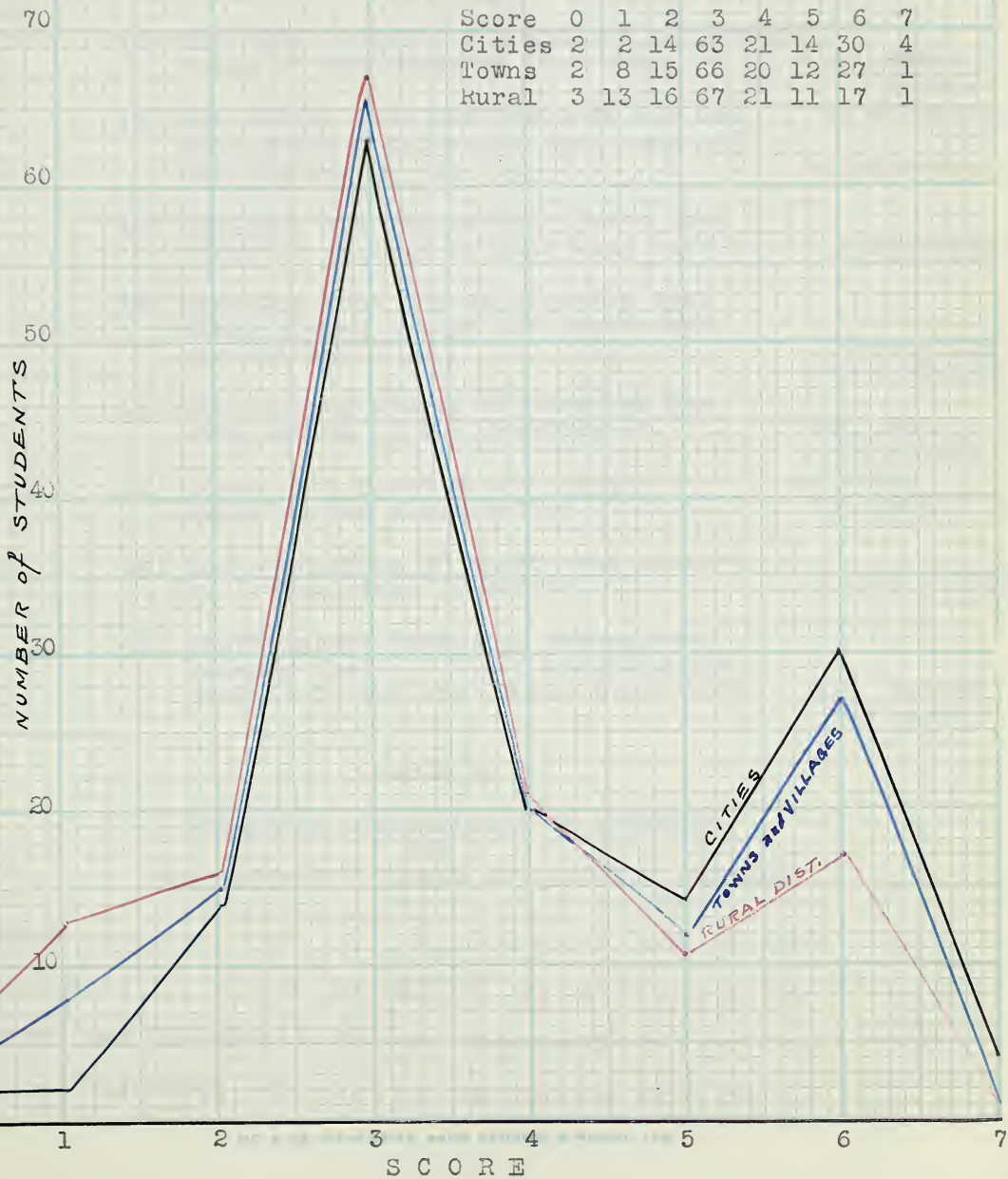
TABLE LIV

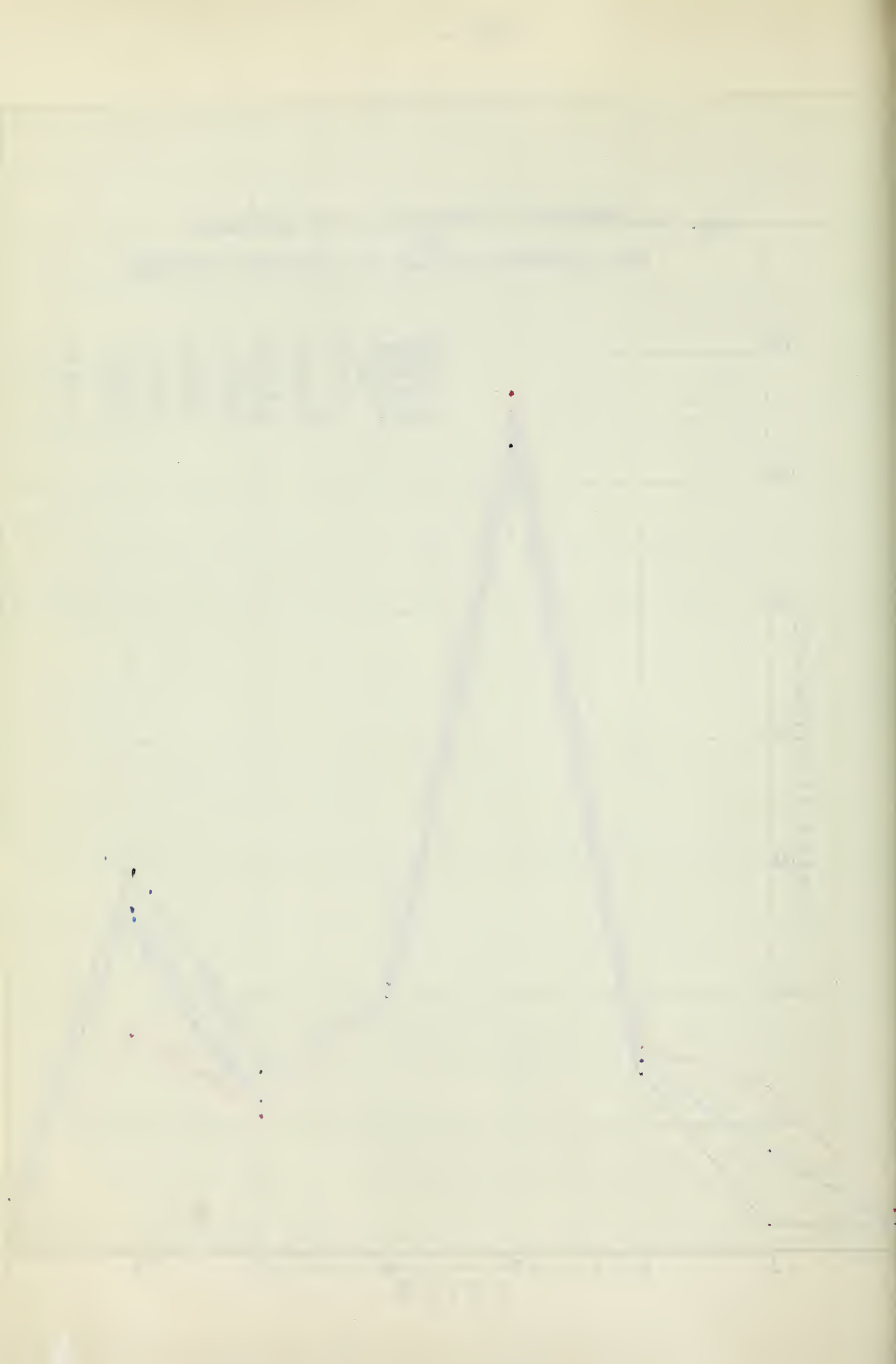
FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT PARTS OF QUESTION THIRTEEN

Part (Number of Students out of 150 for each of the three groups.
(with correct answers

(1)	Cities	Towns and Villages	Rural Districts
	141 or 94%	140 or 93.33%	138 or 92%
(2)	46 or 30.67%	46 or 30.67%	32 or 21.33%
(3)	136 or 90.67%	133 or 88.67%	126 or 84%
(4)	48 or 32%	43 or 28.67%	34 or 22.67%
(5)	a. 140 or 93.33%	133 or 88.67%	126 or 84%
	b. 8 or 5.33%	1 or 2/3 of 1%	3 or 2%
(6)	59 or 39.33%	47 or 31.33%	39 or 26%

Fig. 22- FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION THIRTEEN





QUESTION FOURTEEN
with
ANSWERS

Value

8 14. Directions:

Put in the brackets at the right the word or short phrase which is missing from each of the following sentences.

- (a) The name 'microbe' is applied to certain forms of life because they are..... a. (~~small~~.....) minute
- (b) The reason that the ancients did not know about microbes is that they had not learned to use the b. (microscope)
- (c) Bacteria are one-celled plants that resemble animals in that they have no.. c. (chlorophyll)
- (d) Microbes that depend directly upon other living things for their food are called..... d. (parasites) or parasitic.
- (e) The resting spores of microbes become active in the presence of.... e. (~~wet~~.....) moisture
- (f) Yeast is a plant microbe that belongs to the class called..... f. (fungi)
- (g) The conversion of sugar into alcohol by living yeast is called..... g. (fermentation)
- (h) Fruit juices "spoil of themselves" because the..... of microbes are present in the air almost everywhere. h. (~~spores~~.....) or cysts

TABLE IV

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION FOURTEEN

Score	0	1	2	3	4	5	6	7	8
Cities	8	22	41	41	22	11	4	0	0
Towns and Villages	12	23	46	36	16	11	5	1	0
Rural Districts	19	31	46	29	15	8	2	0	0

Fig.23-FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION FOURTEEN

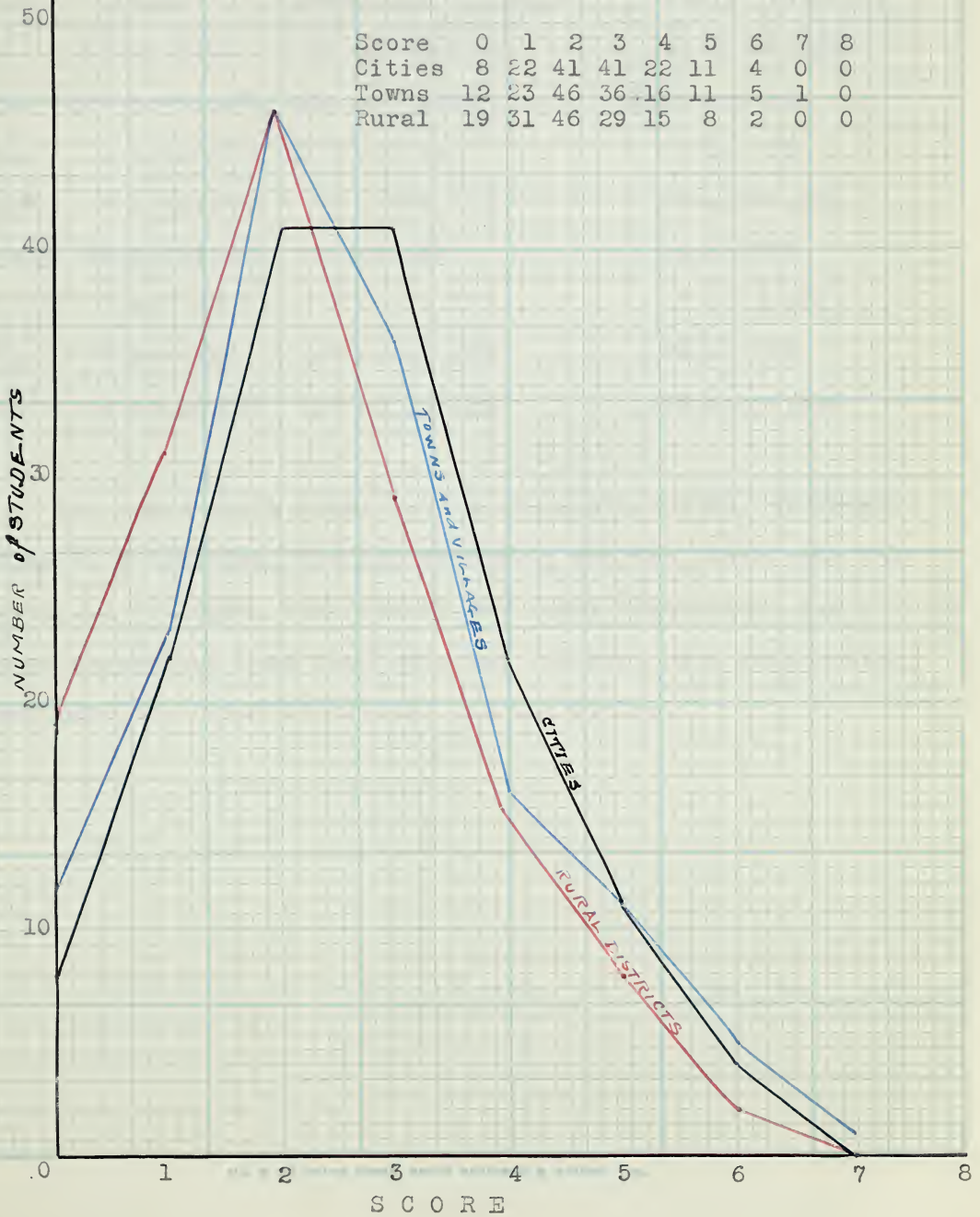


TABLE LVI

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT PARTS OF QUESTION FOURTEEN

Part	Number of Students out of 150 for each of the three groups. (with correct answers)		
(a)	Cities	Towns and Villages	Rural Districts
	96 or 64%	91 or 60.67%	71 or 47.33%
(b)	130 or 86.67%	119 or 79.33%	105 or 70%
(c)	1 or 2/3 of 1%	6 or 4%	3 or 2%
(d)	37 or 24.67%	52 or 34.67%	43 or 28.67%
(e)	25 or 16.67%	24 or 16%	18 or 12%
(f)	9 or 6%	8 or 5.33%	7 or 4.67%
(g)	63 or 42%	62 or 41.33%	54 or 36%
(h)	34 or 22.67%	20 or 13.33%	20 or 13.33%

The above table shows the usual results of the different parts of a question; the Cities are at the top, then come the Towns and Villages, and finally the Rural Districts. Section (d) is an exception; here the Towns and Villages have done better, then come the Rural Districts, and the Cities.

QUESTION FIFTEEN
with
ANSWERS

Value

7 15. Directions:

Complete the following sentences by placing in the brackets st the right the proper term or phrase relative to water (hydro-electric) development.

- (a) Water operating a turbine producesenergy. (a) (..... kinetic)
- (b)energy is stored at the dam. (b) (potential)
- (c) A.....is used to deliver water to the wheel. (c) (water pipe or flume.)
- (d) The height of water in a reservoir above the power plant is called the of water. (d) (head)
- (e) The motion of the water wheel is transmitted to the generator by means of a (e) (shaft)
- (f) The two factors determining the amount of available water power are....(1),.....,(2)..... (f) (1) (volume) or rainfall; or quantity; (2) high head; or head; or fall of water.

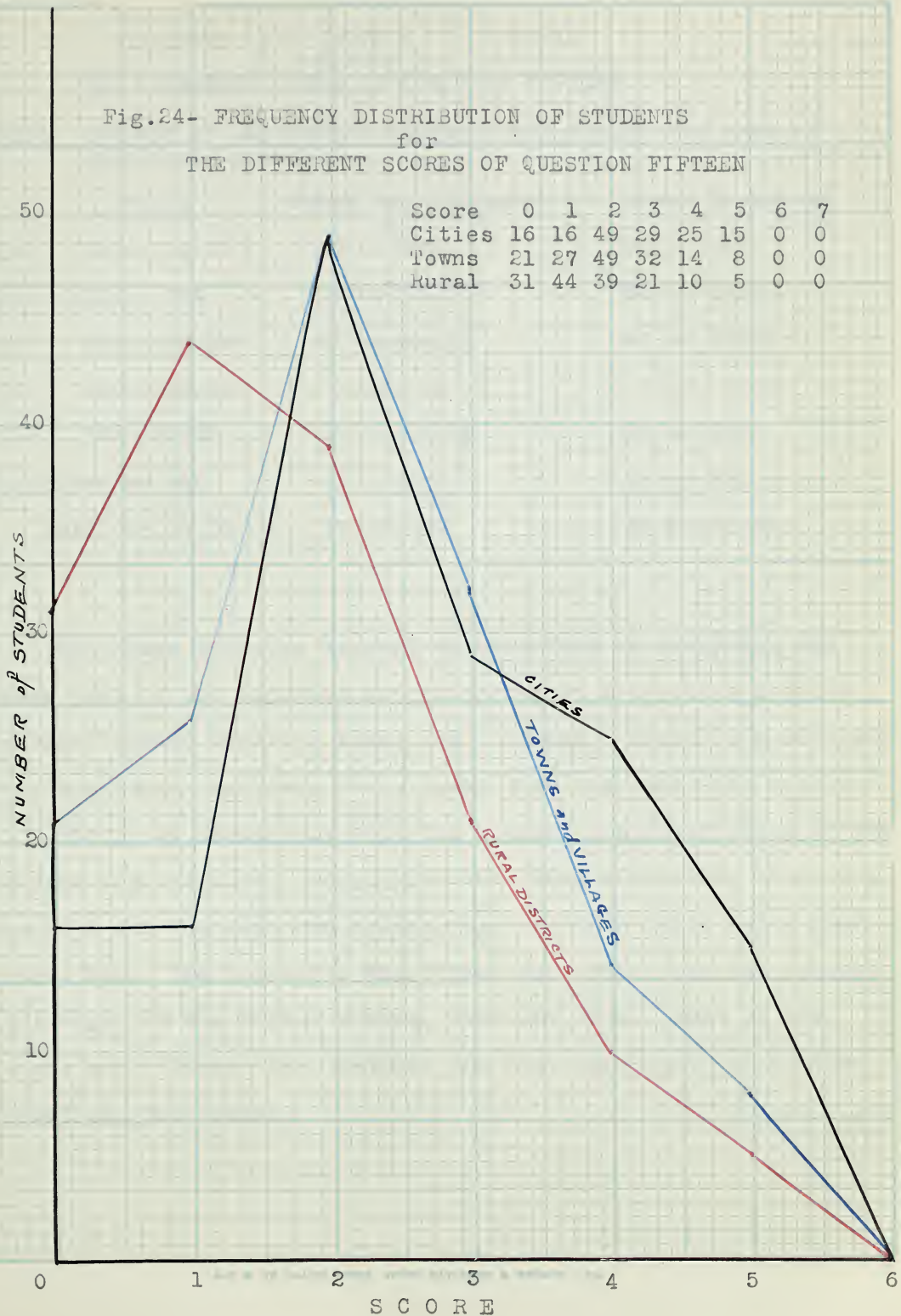
TABLE LVII

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION FIFTEEN

Score	0	1	2	3	4	5	6	7
Cities	16	16	49	29	25	15	0	0
Towns and Villages	21	27	49	32	14	8	0	0
Rural Districts	31	44	39	21	10	5	0	0

Fig.24- FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION FIFTEEN

Score	0	1	2	3	4	5	6	7
Cities	16	16	49	29	25	15	0	0
Towns	21	27	49	32	14	8	0	0
Rural	31	44	39	21	10	5	0	0



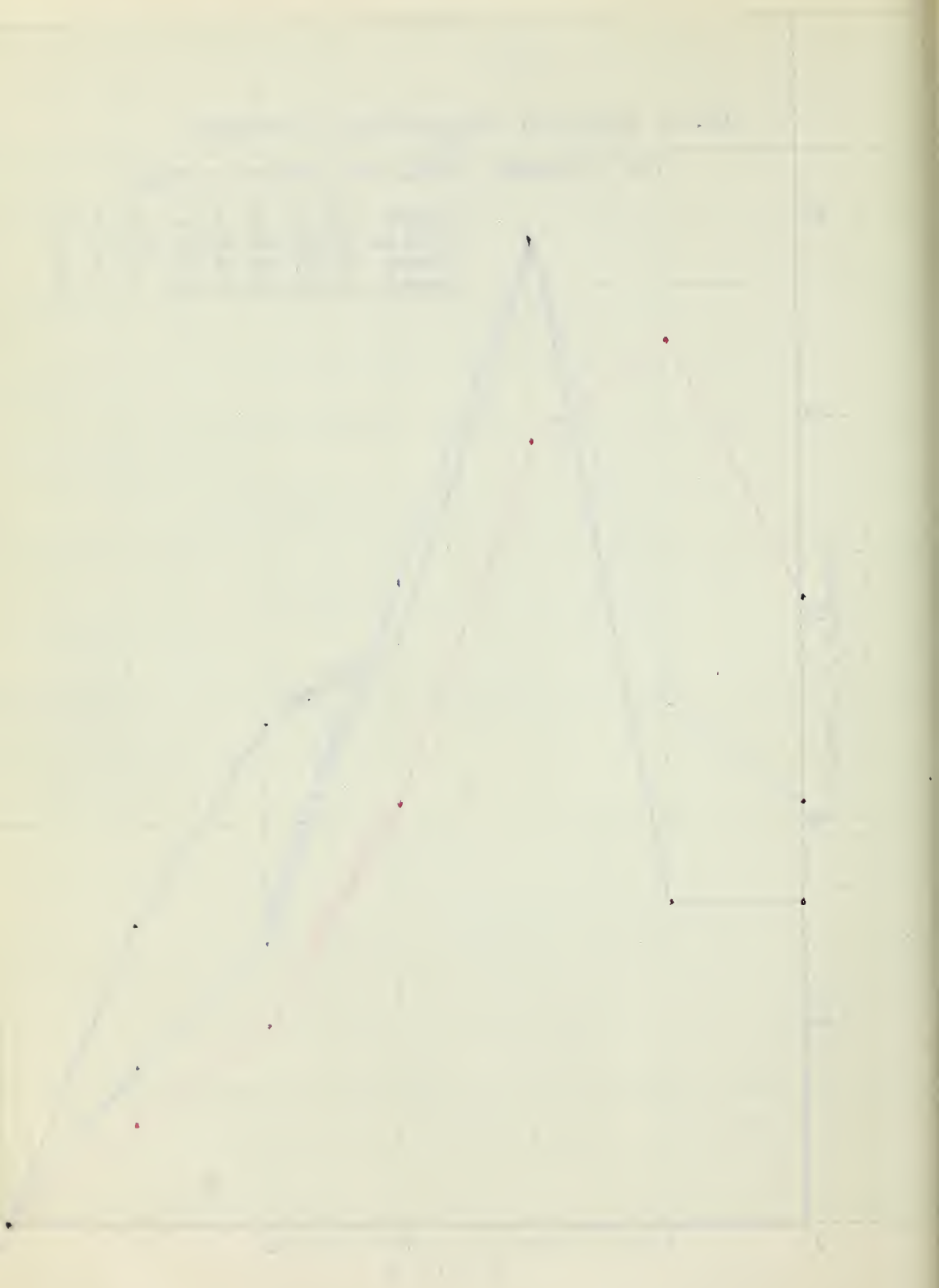


TABLE LVIII

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT PARTS OF QUESTION FIFTEEN

Part	Number of successful students out of 150 for each of the three groups.		
	Cities	Towns and Villages	Rural Districts
(a)	74 or 49.3%	66 or 44%	54 or 36%
(b)	105 or 70%	95 or 63.3%	68 or 45.3%
(c)	56 or 37.3%	52 or 34.7%	40 or 26.7%
(d)	16 or 10.7%	9 or 6%	4 or 2.7%
(e)	27 or 18%	25 or 16.7%	27 or 18%
(f)(1)	57 or 38%	42 or 28%	33 or 22%
(2)	41 or 27.3%	27 or 18%	25 or 16.7%

The above table is typical of this form of analysis, for each part of the question more students in the cities had the correct answer than the towns and villages. There is a tendency for the rural districts to be lower than the other two groups.

Figure 24 shows very well the typical characteristics of the scores for the three groups; for the rural districts, the curve is high for the zero and one scores, and then falls below the other two. The curve for the cities is low for the low scores, but high for the higher scores, four and five. That of the towns and villages lies between the two, especially so at the start and the finish.

QUESTION SIXTEEN
with
ANSWERS

Value

10 16. Directions:

In the brackets after each item in COLUMN B, put the number of the item in COLUMN A that goes with it.

COLUMN A	COLUMN B
1. changes electrical energy into mechanical energy	The steam engine....(..7...)
2. burns only hard coal.	The flywheel of any engine (...9...)
3. changes mechanical energy into heat energy.	The internal combustion engine.....(..4...)
4. changes chemical energy into kinetic energy of moving objects.	The street car is driven by a motor that.....(..1...)
5. reduces friction on trains, automobiles and balloons.	Friction of bearings in wheels and other parts of locomotives and automobiles.....(..3...)
6. acts as a lever.	The use of smooth surfaces and 'cigar-shaped' bodies.....(..5...)
7. changes heat energy into mechanical energy of motion.	In a rowboat the oar.....(..6...)
8. comes from rapidly moving molecules of hot gas.	The force acting on the piston of steam engines and gas engines.....(..8...)
9. should have a great deal of inertia.	A propeller driving a boat.....(..10...)
10. works like a screw.	A steel ship can float, since a body immersed in water.....(..11...)
11. loses weight equal to the weight of water it displaces.	

TABLE L IX

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT PARTS OF QUESTION SIXTEEN

Part	Number of Students out of 150 for each of the three groups. (successful)		
	Cities	Towns and Villages	Rural Districts
(1)	108 or 72%	90 or 60%	95 or 63.33%
(3)	43 or 28.67%	32 or 21.33%	23 or 15.33%
(4)	51 or 34%	41 or 27.33%	36 or 24%
(5)	107 or 71.33%	92 or 61.33%	80 or 53.33%
(6)	127 or 84.67%	123 or 82%	116 or 77.33%
(7)	54 or 36%	57 or 38%	53 or 35.33%
(8)	80 or 53.33%	80 or 53.33%	66 or 44%
(9)	57 or 38%	44 or 29.33%	27 or 18%
((10)	117 or 78%	96 or 64%	95 or 63.33%
(11)	143 or 95.33%	141 or 94%	140 or 93.33%

Most of the figures, in the above table, show a definite decline for the Towns and Villages, and the Rural Districts. There are two exceptions that may be due to the limited number of students in the sample. A larger sample may raise the figure for the Towns and Villages in part (1); it may also increase the figure for part (7) for the Cities.

The author further believes that the jagged peaks of Figure 25 would become smooth curves and cross in the middle, at the score five, for the total population of the candidates for the Province. The ends of these curves indicate the general tendencies; the red curve tends to be at the top for the first half and at the bottom for the second half of the graph, with the blue in the middle.

Fig. 25-FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION SIXTEEN

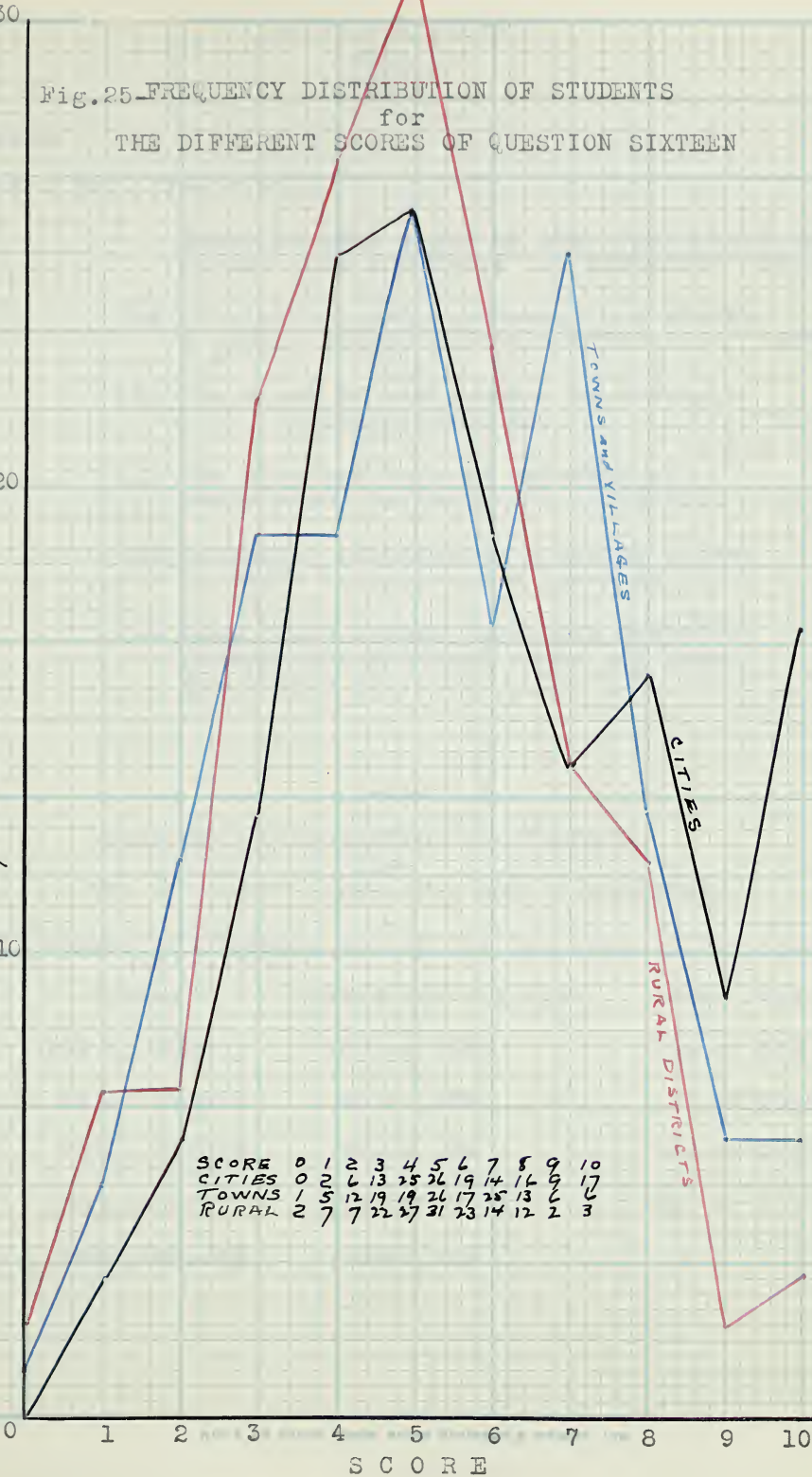
NUMBER OF STUDENTS

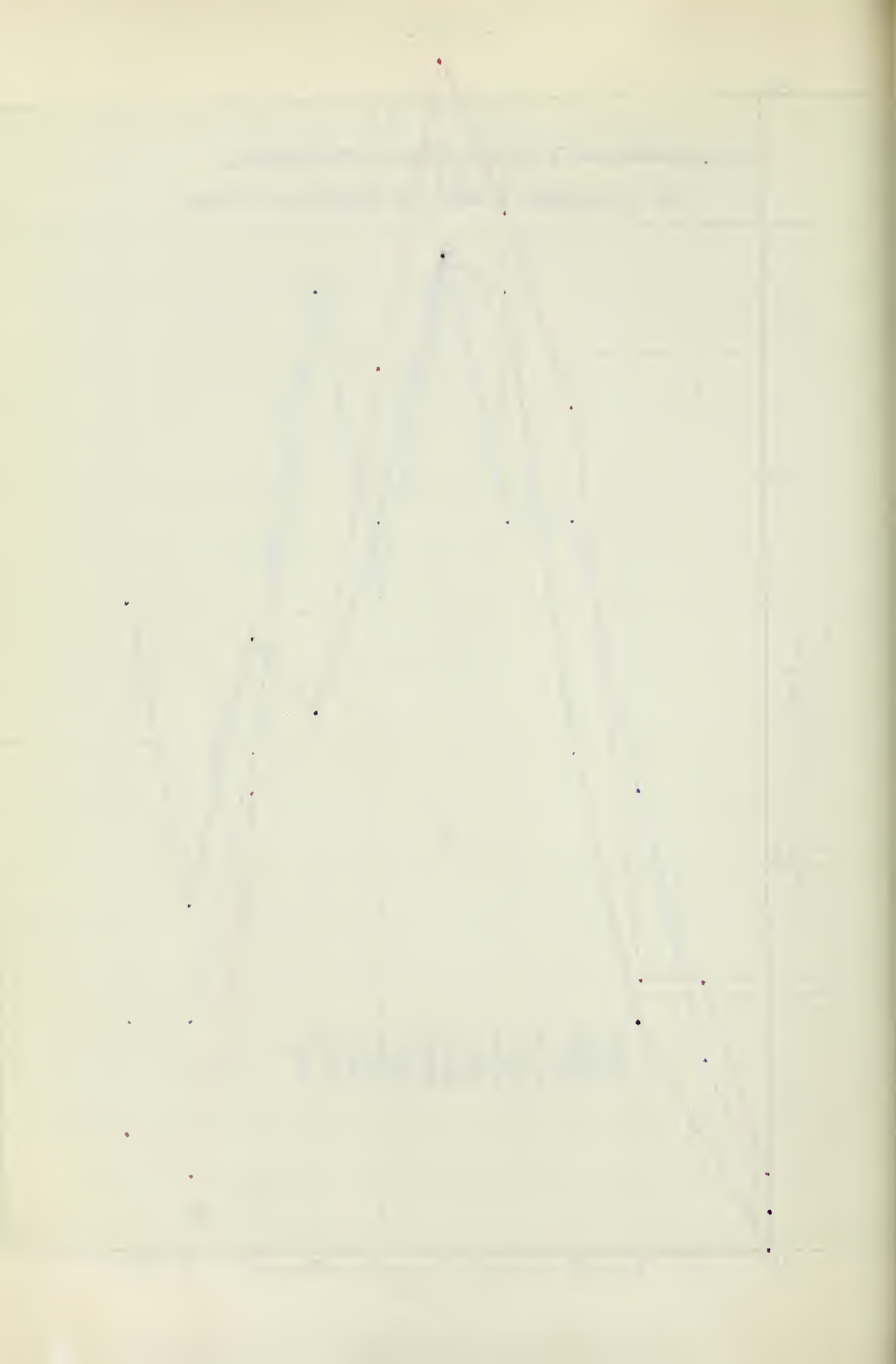
TOWNS AND VILLAGES

CITIES

RURAL DISTRICTS

SCORE	0	1	2	3	4	5	6	7	8	9	10
CITIES	0	2	6	13	25	26	19	14	16	9	17
TOWNS	1	5	12	19	26	17	25	13	6	2	3
RURAL	2	7	7	22	27	31	23	14	12	2	3





QUESTION SEVENTEEN
with
ANSWERS

Value

5 17. Directions:

Write in each space at the right the word or phrase that completes the statement correctly.

- (a) In giving a radio address in a studio a person stands in front of a a.(microphone.)
- (b) The speed of radio waves is about... miles per second. b.(.186,000...) or the same as light.
- (c) The simplest form of detector of radio waves is thedetector. c.(.crystal...) or galena.
- (d) Clashing, clicking or grinding noises in radio reception are known as..... d.(.static...)
- (e) When radio vacuum tubes are heated to glowing the filament sends off great quantities of..... e.(electrons.)

TABLE L X

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT PARTS OF QUESTION SEVENTEEN

Part	Number of Students out of 150 for each of the three groups. (successful)		
	Cities	Towns and Villages	Rural Districts
(a)	150 or 100%	150 or 100%	144 or 96%
(b)	52 or 34.33%	48 or 32%	37 or 24.67%
(c)	35 or 23.33%	12 or 8%	16 or 10.67%
(d)	124 or 82.67%	119 or 79.33%	107 or 71.33%
(e)	16 or 10.67%	3 or 2%	0

Fig.26- FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION SEVENTEEN

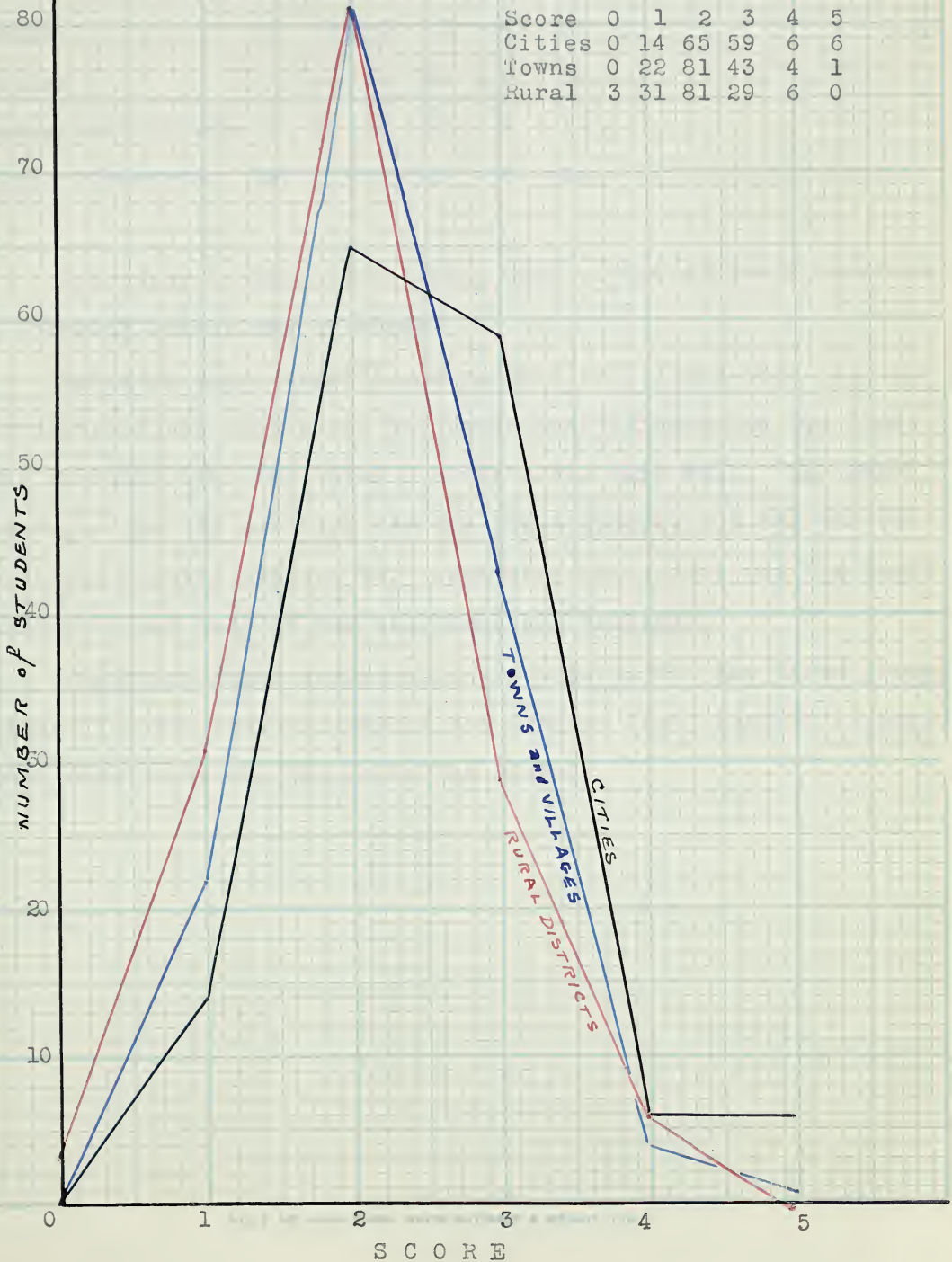


TABLE LXI

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION SEVENTEEN

Score	0	1	2	3	4	5
Cities	0	14	65	59	6	6
Towns and Villages	0	22	81	43	4	1
Rural Districts	3	31	81	29	6	0

According to the above table, most of the students received a score of either two or three.

Table LX shows significant results in (a) and (d). All the students of the Cities and the Towns and Villages had the first one correct; even the Rural Districts did very well. The percentages for (d) are high for the three groups, but for the (e) part the results are the very opposite; it is zero for the Rural Districts and only 2% for the Towns and Villages.

Figure 26 shows curves that are typical for the three groups, except for the score of two in the Cities; that, however is more than made up by the bulge to the right.

TABLE I
Summary of the results of the
analysis of variance for the
effect of the treatment on the
growth of the plants

Treatment	Mean height (cm)	Standard error	Significance
Control	10.5	0.5	
1	11.2	0.5	
2	11.8	0.5	
3	12.5	0.5	
4	13.2	0.5	
5	14.0	0.5	
6	14.8	0.5	
7	15.5	0.5	
8	16.2	0.5	
9	17.0	0.5	
10	17.8	0.5	
11	18.5	0.5	
12	19.2	0.5	
13	20.0	0.5	
14	20.8	0.5	
15	21.5	0.5	
16	22.2	0.5	
17	23.0	0.5	
18	23.8	0.5	
19	24.5	0.5	
20	25.2	0.5	
21	26.0	0.5	
22	26.8	0.5	
23	27.5	0.5	
24	28.2	0.5	
25	29.0	0.5	
26	29.8	0.5	
27	30.5	0.5	
28	31.2	0.5	
29	32.0	0.5	
30	32.8	0.5	
31	33.5	0.5	
32	34.2	0.5	
33	35.0	0.5	
34	35.8	0.5	
35	36.5	0.5	
36	37.2	0.5	
37	38.0	0.5	
38	38.8	0.5	
39	39.5	0.5	
40	40.2	0.5	
41	41.0	0.5	
42	41.8	0.5	
43	42.5	0.5	
44	43.2	0.5	
45	44.0	0.5	
46	44.8	0.5	
47	45.5	0.5	
48	46.2	0.5	
49	47.0	0.5	
50	47.8	0.5	
51	48.5	0.5	
52	49.2	0.5	
53	50.0	0.5	
54	50.8	0.5	
55	51.5	0.5	
56	52.2	0.5	
57	53.0	0.5	
58	53.8	0.5	
59	54.5	0.5	
60	55.2	0.5	
61	56.0	0.5	
62	56.8	0.5	
63	57.5	0.5	
64	58.2	0.5	
65	59.0	0.5	
66	59.8	0.5	
67	60.5	0.5	
68	61.2	0.5	
69	62.0	0.5	
70	62.8	0.5	
71	63.5	0.5	
72	64.2	0.5	
73	65.0	0.5	
74	65.8	0.5	
75	66.5	0.5	
76	67.2	0.5	
77	68.0	0.5	
78	68.8	0.5	
79	69.5	0.5	
80	70.2	0.5	
81	71.0	0.5	
82	71.8	0.5	
83	72.5	0.5	
84	73.2	0.5	
85	74.0	0.5	
86	74.8	0.5	
87	75.5	0.5	
88	76.2	0.5	
89	77.0	0.5	
90	77.8	0.5	
91	78.5	0.5	
92	79.2	0.5	
93	80.0	0.5	
94	80.8	0.5	
95	81.5	0.5	
96	82.2	0.5	
97	83.0	0.5	
98	83.8	0.5	
99	84.5	0.5	
100	85.2	0.5	

The results of the analysis of variance for the effect of the treatment on the growth of the plants are shown in Table I. The mean height of the plants in each treatment group is given in the first column, and the standard error of the mean is given in the second column. The significance of the differences between the treatments is indicated by the letters in the third column. The letters A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, AA, AB, AC, AD, AE, AF, AG, AH, AI, AJ, AK, AL, AM, AN, AO, AP, AQ, AR, AS, AT, AU, AV, AW, AX, AY, AZ, BA, BB, BC, BD, BE, BF, BG, BH, BI, BJ, BK, BL, BM, BN, BO, BP, BQ, BR, BS, BT, BU, BV, BW, BX, BY, BZ, CA, CB, CC, CD, CE, CF, CG, CH, CI, CJ, CK, CL, CM, CN, CO, CP, CQ, CR, CS, CT, CU, CV, CW, CX, CY, CZ, DA, DB, DC, DD, DE, DF, DG, DH, DI, DJ, DK, DL, DM, DN, DO, DP, DQ, DR, DS, DT, DU, DV, DW, DX, DY, DZ, EA, EB, EC, ED, EE, EF, EG, EH, EI, EJ, EK, EL, EM, EN, EO, EP, EQ, ER, ES, ET, EU, EV, EW, EX, EY, EZ, FA, FB, FC, FD, FE, FF, FG, FH, FI, FJ, FK, FL, FM, FN, FO, FP, FQ, FR, FS, FT, FU, FV, FW, FX, FY, FZ, GA, GB, GC, GD, GE, GF, GG, GH, GI, GJ, GK, GL, GM, GN, GO, GP, GQ, GR, GS, GT, GU, GV, GW, GX, GY, GZ, HA, HB, HC, HD, HE, HF, HG, HH, HI, HJ, HK, HL, HM, HN, HO, HP, HQ, HR, HS, HT, HU, HV, HW, HX, HY, HZ, IA, IB, IC, ID, IE, IF, IG, IH, II, IJ, IK, IL, IM, IN, IO, IP, IQ, IR, IS, IT, IU, IV, IW, IX, IY, IZ, JA, JB, JC, JD, JE, JF, JG, JH, JI, JJ, JK, JL, JM, JN, JO, JP, JQ, JR, JS, JT, JU, JV, JW, JX, JY, JZ, KA, KB, KC, KD, KE, KF, KG, KH, KI, KJ, KK, KL, KM, KN, KO, KP, KQ, KR, KS, KT, KU, KV, KW, KX, KY, KZ, LA, LB, LC, LD, LE, LF, LG, LH, LI, LJ, LK, LL, LM, LN, LO, LP, LQ, LR, LS, LT, LU, LV, LW, LX, LY, LZ, MA, MB, MC, MD, ME, MF, MG, MH, MI, MJ, MK, ML, MM, MN, MO, MP, MQ, MR, MS, MT, MU, MV, MW, MX, MY, MZ, NA, NB, NC, ND, NE, NF, NG, NH, NI, NJ, NK, NL, NM, NN, NO, NP, NQ, NR, NS, NT, NU, NV, NW, NX, NY, NZ, OA, OB, OC, OD, OE, OF, OG, OH, OI, OJ, OK, OL, OM, ON, OO, OP, OQ, OR, OS, OT, OU, OV, OW, OX, OY, OZ, PA, PB, PC, PD, PE, PF, PG, PH, PI, PJ, PK, PL, PM, PN, PO, PP, PQ, PR, PS, PT, PU, PV, PW, PX, PY, PZ, QA, QB, QC, QD, QE, QF, QG, QH, QI, QJ, QK, QL, QM, QN, QO, QP, QQ, QR, QS, QT, QU, QV, QW, QX, QY, QZ, RA, RB, RC, RD, RE, RF, RG, RH, RI, RJ, RK, RL, RM, RN, RO, RP, RQ, RR, RS, RT, RU, RV, RW, RX, RY, RZ, SA, SB, SC, SD, SE, SF, SG, SH, SI, SJ, SK, SL, SM, SN, SO, SP, SQ, SR, SS, ST, SU, SV, SW, SX, SY, SZ, TA, TB, TC, TD, TE, TF, TG, TH, TI, TJ, TK, TL, TM, TN, TO, TP, TQ, TR, TS, TT, TU, TV, TW, TX, TY, TZ, UA, UB, UC, UD, UE, UF, UG, UH, UI, UJ, UK, UL, UM, UN, UO, UP, UQ, UR, US, UT, UU, UV, UW, UX, UY, UZ, VA, VB, VC, VD, VE, VF, VG, VH, VI, VJ, VK, VL, VM, VN, VO, VP, VQ, VR, VS, VT, VU, VV, VW, VX, VY, VZ, WA, WB, WC, WD, WE, WF, WG, WH, WI, WJ, WK, WL, WM, WN, WO, WP, WQ, WR, WS, WT, WU, WV, WW, WX, WY, WZ, XA, XB, XC, XD, XE, XF, XG, XH, XI, XJ, XK, XL, XM, XN, XO, XP, XQ, XR, XS, XT, XU, XV, XW, XX, XY, XZ, YA, YB, YC, YD, YE, YF, YG, YH, YI, YJ, YK, YL, YM, YN, YO, YP, YQ, YR, YS, YT, YU, YV, YW, YX, YY, YZ, ZA, ZB, ZC, ZD, ZE, ZF, ZG, ZH, ZI, ZJ, ZK, ZL, ZM, ZN, ZO, ZP, ZQ, ZR, ZS, ZT, ZU, ZV, ZW, ZX, ZY, ZZ.

CHAPTER VIII

Question 18.

THE PUSH BUTTON

Value 3. Directions:

Show how the cell and the bell could be connected to ring only when the push button is pressed.
Draw lines to represent the wires.

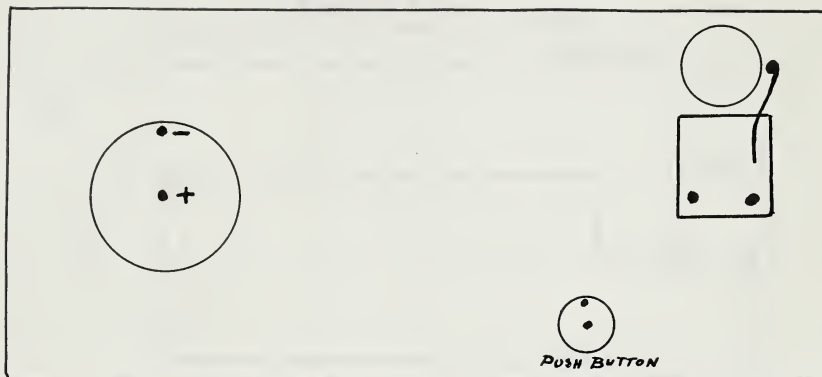


Figure 27.

The diagram is not as good as it might be, the centre post of the PUSH BUTTON was taken by many to be the button itself while the dot at the side was used a terminal. Some did not like the armature in mid air without the spring and without the electro-magnets. These students carefully added the missing parts to the diagram and drew a side view of the Push Button to show how contact could be made when the Button is pressed.

The Key reads as follows:

Must show a series plan or no value.
3 points for the question; 1 point
for each connector wire.

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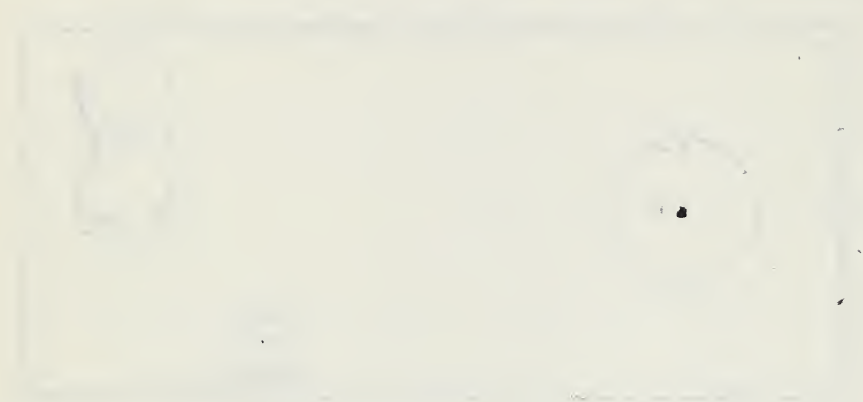


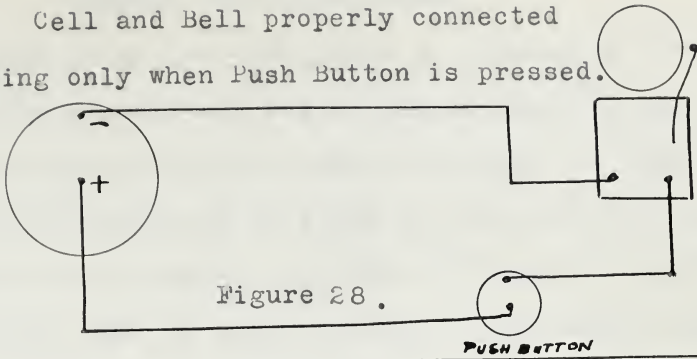
FIGURE 1

The following is a list of the names of the members of the American Medical Association, who have been elected to the office of President of the Association for the year 1911. The names are listed in alphabetical order, and are given in full, including the name of the State or Territory to which they belong. The names are given in the order in which they were elected, and are given in the order in which they were elected to the office of President of the Association for the year 1911.

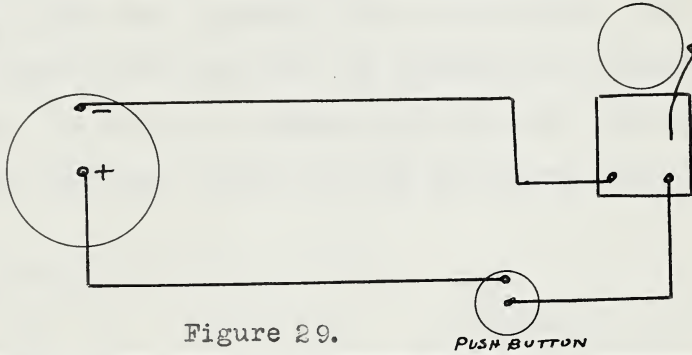
THE NEW YORK MEDICAL ASSOCIATION

THE NEW YORK MEDICAL ASSOCIATION was organized in 1901, and has since that time been one of the most active and successful of the medical associations of the United States. It has a membership of over 1,000, and has been successful in securing the recognition of the medical profession in the State of New York.

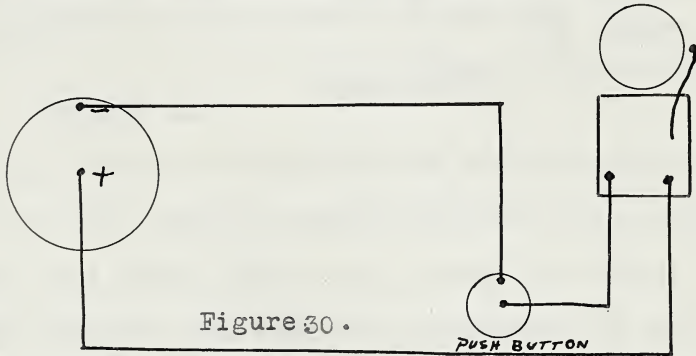
Cell and Bell properly connected
to ring only when Push Button is pressed.



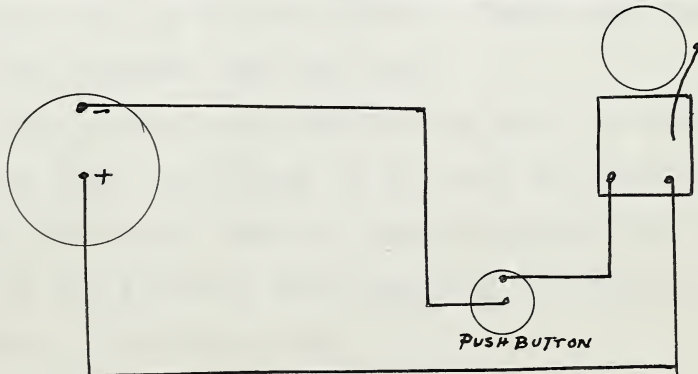
OR



OR



OR



CHAPTER VIII (Continued)

In Question 18 we have two ideas or principles involved, those of the two-wire circuit and the switch or push button. Most of the candidates were able to do the first part, as Table LXII indicates; only thirty-six or eight per cent out of the four hundred fifty had one wire. A number of students introduced a third principle, that of short circuit. Here again were thirty-two or 7.1% of the four hundred fifty candidates. The two terminals might have given most of the students the idea of the two-wire circuit, but the most common error was the passing of both wires through the push button, in the following manner:

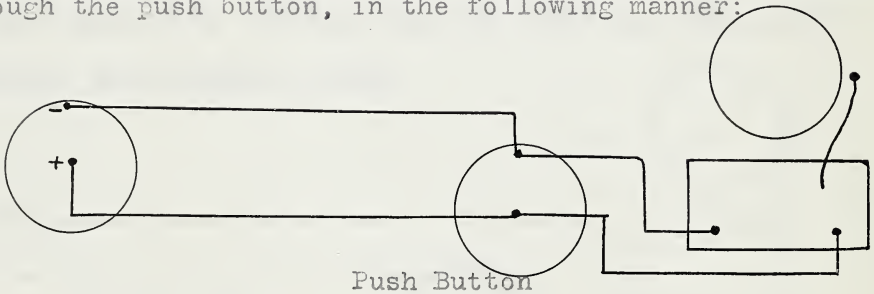
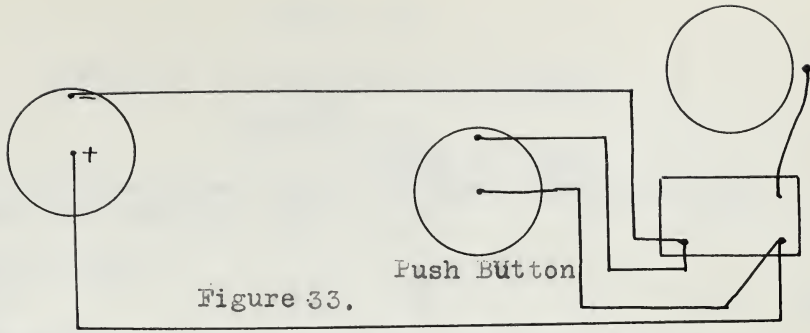


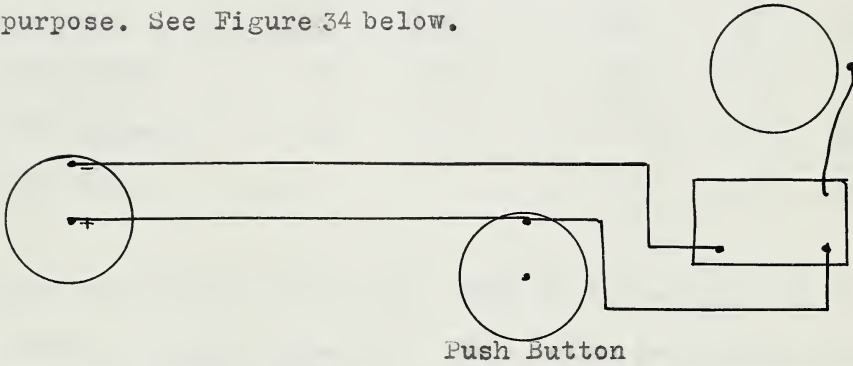
Figure 32.

One hundred sixteen or 25.8% of the students made this error. These people did not seem to realize that the bell would ring all the time, and that there wasn't any reason for having the PUSH BUTTON. Some students that did not understand the principle of the push button left it out altogether. There were twenty-six or 5.8% of all the students that did this.

Another very common error was the one with the two wires going directly from the battery to the bell and then back to the push button. Here again they did not understand that the bell would ring all the time and that there was no object in having the push button. See Figure 33.



Still another common error was that with the one wire directly from the battery to the bell and the other fastened to one post of the PUSH BUTTON. The other post apparently was taken to be the button itself. Here again the students did not seem to realize that the bell would ring all the time and that the PUSH BUTTON had no purpose. See Figure 34 below.



Three out of the group under consideration left out the Battery. Two, out of the author's group, left out the Bell.

Thirty-two or 7.11% of all the students deliberately caused a SHORT CIRCUIT by having the two terminals of the battery connected with a wire as the following figure indicates:

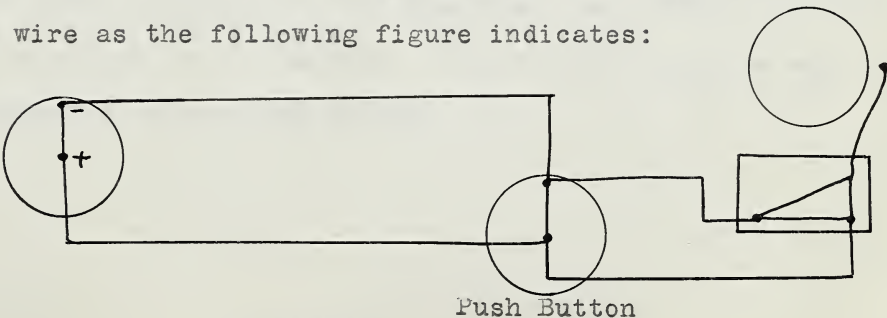


TABLE LXII

FREQUENCY DISTRIBUTION OF STUDENTS
for
QUESTION 18

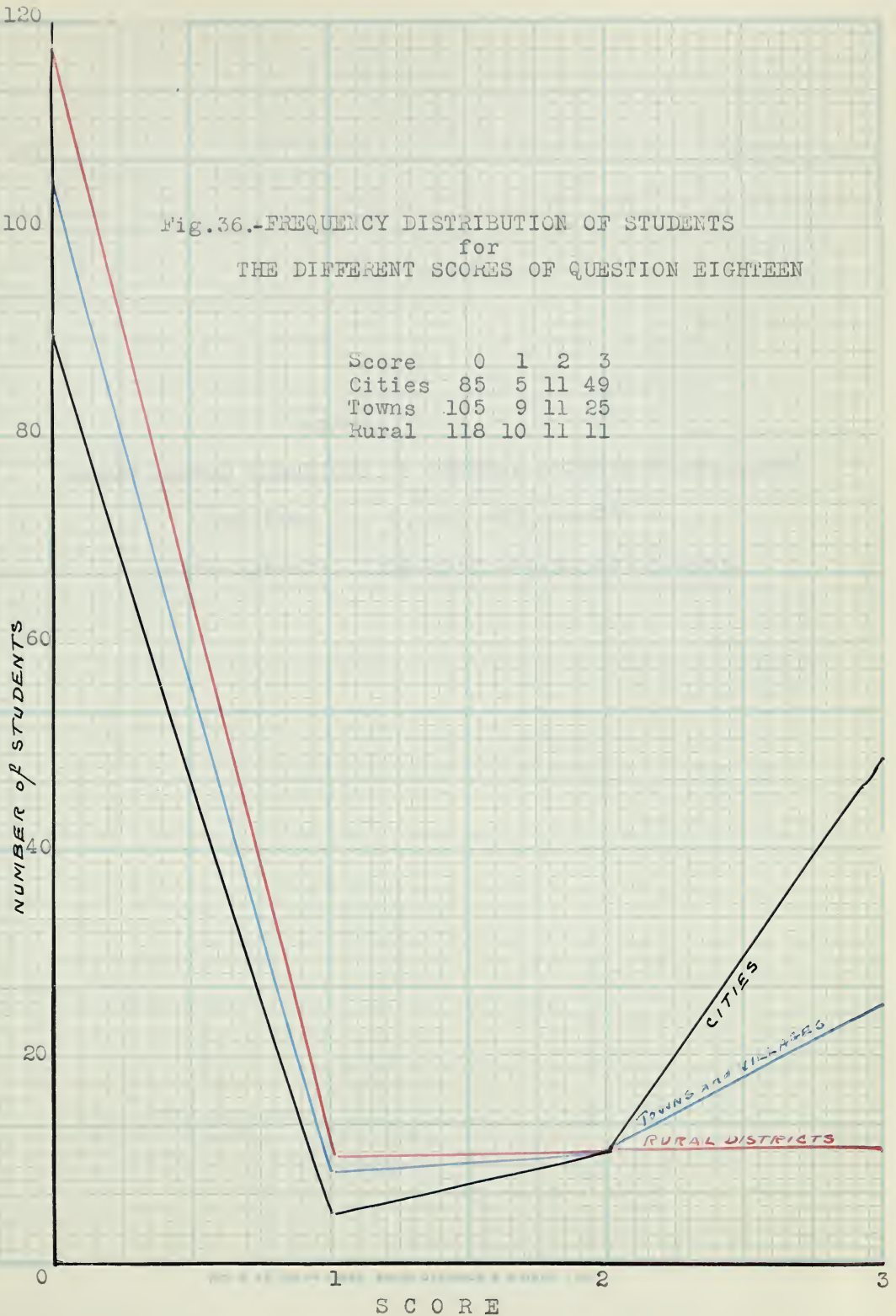
Wires and Connections	Cities	Towns & Rural Villages	Districts	Total	%
Three wires, all correct	44	23	10	77	17.11
Both wires through Push Button	31	38	47	116	25.78
Both wires direct to Bell, then Button	19	29	20	68	15.11
Two wires, one through Button	11	20	16	47	10.44
One wire	6	10	20	36	8.
Short Circuit	15	6	11	32	7.11
No wires	10	13	17	40	8.89
Omitted the Button	9	10	7	26	5.78
Omitted the Battery	2	1		3	2/3 of 1%
Omitted the Bell			2	2	4/9 of 1%

As the table above indicates, only 17.11% of all the students had the wires properly connected. This means that almost 83% of all the students failed to grasp the principle of the PUSH BUTTON.

Some of those that had the single wire had it passing through the PUSH BUTTON and then to the BELL. Others had the wire going directly to the BELL and then to the PUSH BUTTON. Still others had the wire going directly to the BELL from the BATTERY and the PUSH BUTTON connected to the BATTERY. The fourth variation was a spliced wire connected to the PUSH BUTTON.

Fig.36.-FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION EIGHTEEN

Score	0	1	2	3
Cities	85	5	11	49
Towns	105	9	11	25
Rural	118	10	11	11



CHAPTER IX

SHORT ANSWER QUESTIONS IN GENERAL SCIENCE (Continued)

QUESTIONS 19, 20, 21, 22 and 23

With Answers, Frequency Tables and Graphs.

QUESTION NINETEEN
with
ANSWERS

Value

- 8 19. Directions:
Fill the blanks in the sentences relating to the telephone.

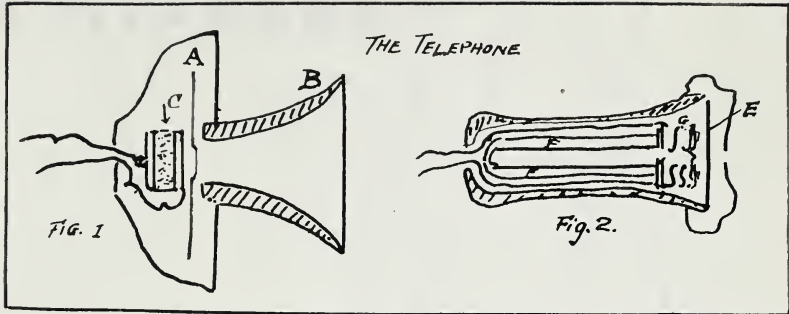


Figure 36a.

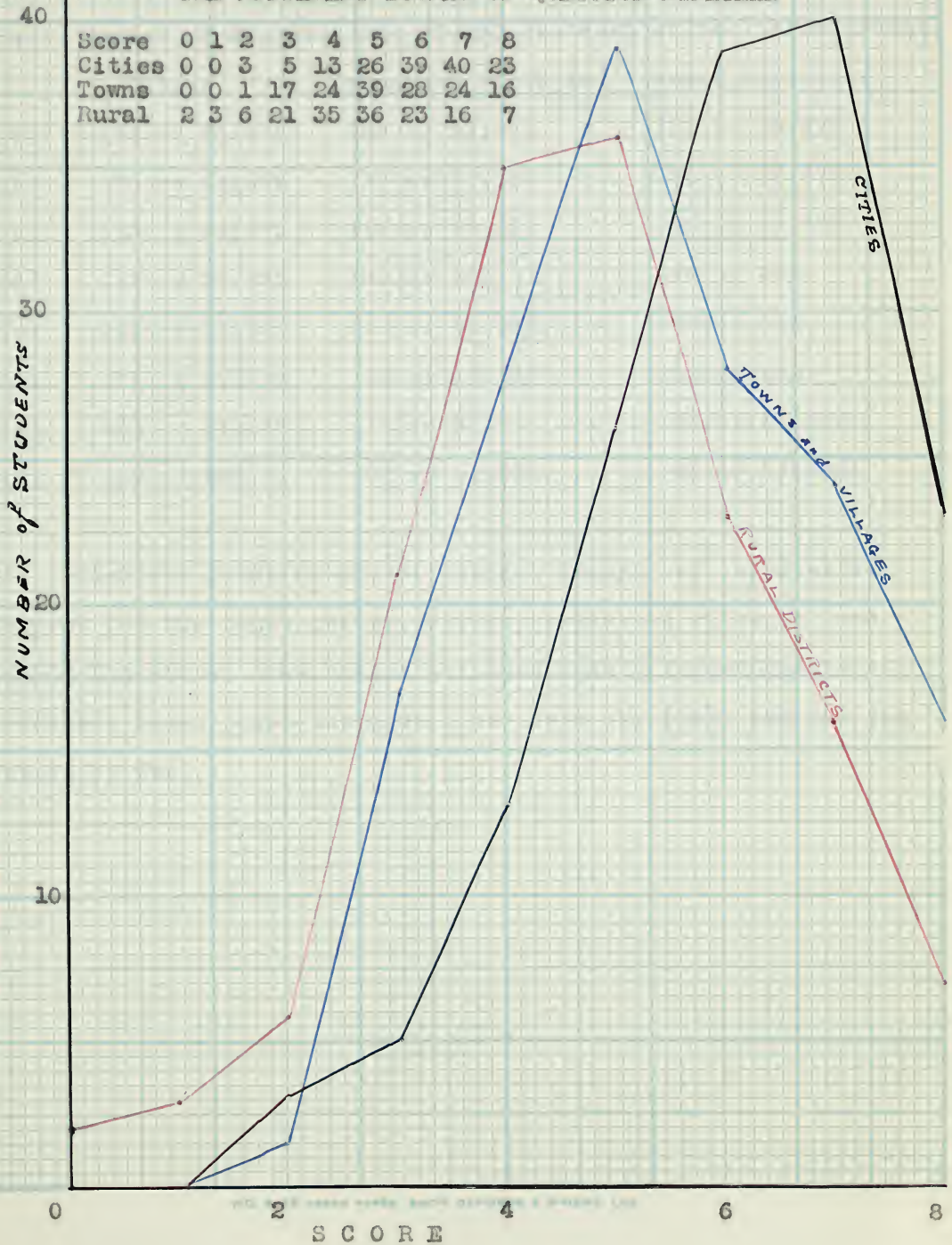
- (a) The telephone was patented by..... (a) Alexander.....
Graham Bell.
- (b) Fig. 1 is a diagram of the..... (b) transmitter...
- (c) Fig. 2 is a diagram of the (c) receiver.....
- (d) In which figure is the electrical energy changed to mechanical energy and then to sound? (d) Fig. 2.....
- (e) The mouthpiece is lettered..... (e) B.....
- (f) The magnet core is lettered..... (f) F.....
- (g) The carbon granules or button is lettered..... (g) C.....
- (h) The electro-magnet is shown at..... (h) G.....

TABLE LXIII

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION NINETEEN

Score	0	1	2	3	4	5	6	7	8
Cities	0	0	3	5	13	26	39	40	23
Towns and Villages	0	0	1	17	24	39	28	24	16
Rural Districts	2	3	6	21	35	36	23	16	7

Fig.37.- FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION NINETEEN



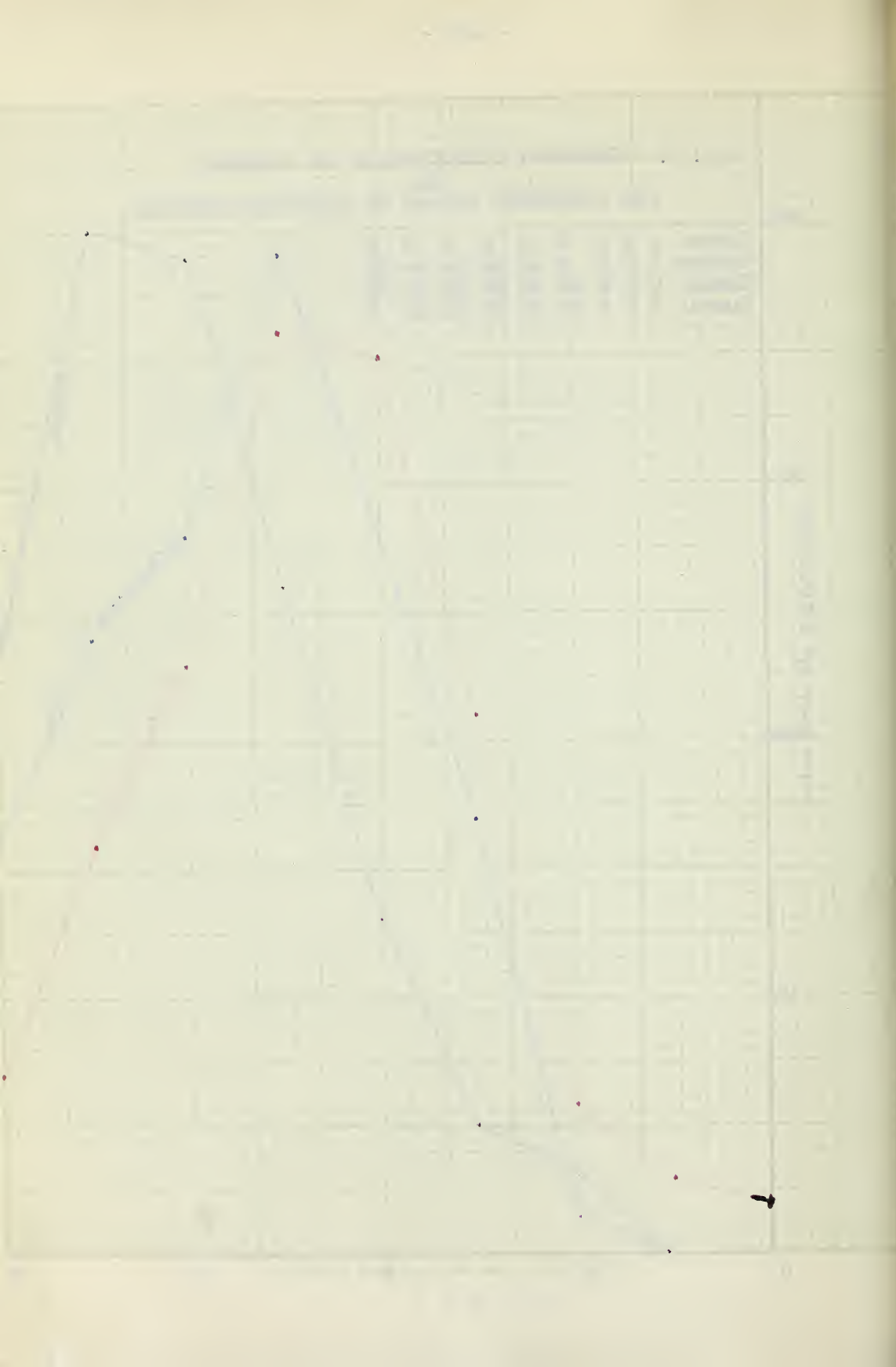


TABLE L XIV

FREQUENCY DISTRIBUTION OF STUDENTS (Successful)
for
THE DIFFERENT PARTS OF QUESTION NINETEEN

Part Number of Students out of 150 for each of the three groups.

	Cities	Towns and Villages	Rural Districts
(a)	143 or 95.33%	139 or 92.67%	136 or 90.67%
(b)	70 or 46.67%	47 or 31.33%	34 or 22.67%
(c)	130 or 86.67%	119 or 79.33%	98 or 65.33%
(d)	115 or 76.67%	102 or 68%	99 or 66%
(e)	143 or 95.33%	143 or 95.33%	138 or 92%
(f)	71 or 47.33%	56 or 37.33%	39 or 26%
(g)	134 or 89.33%	114 or 76%	89 or 59.33%
(h)	102 or 68%	92 or 61.33%	80 or 53.33%

Figure 37 shows an almost perfect example of comparative curves for the three groups, Cities, Towns and Villages, and Rural Districts. The author believes that a larger sample of students would raise the Blue Line above the Black one for the score of Two.

1875

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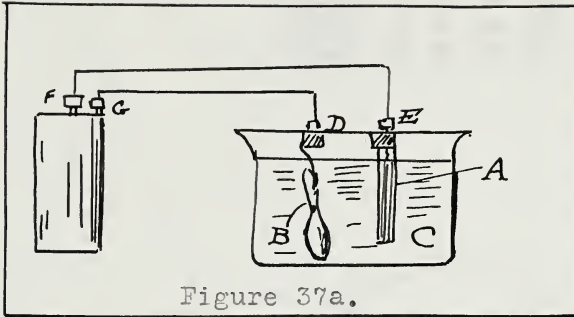
1875

QUESTION TWENTY
with
ANSWERS

Value

7 20. Directions:

Fill the blanks at the right with suitable letters or words referring to the diagram.



The diagram illustrates the process of electroplating.

- (a) The object to be plated must be connected to the.....terminal of the cell. (a) negative; or... minus; or zinc.
- (b) In copper-plating, the electrolyte is..... (b) copper sulphate (solution).
- (c) In copper-plating the letter A stands for a substance that is made of..... (c) copper
- (d) The electrolyte is represented by the letter..... (d) C
- (e) The positive pole of the cell is represented by..... (e) F
- (f) If several cells are used they should be connected in..... (f) series
- (g) What kind of energy is used in electroplating? (g) chemical

1900

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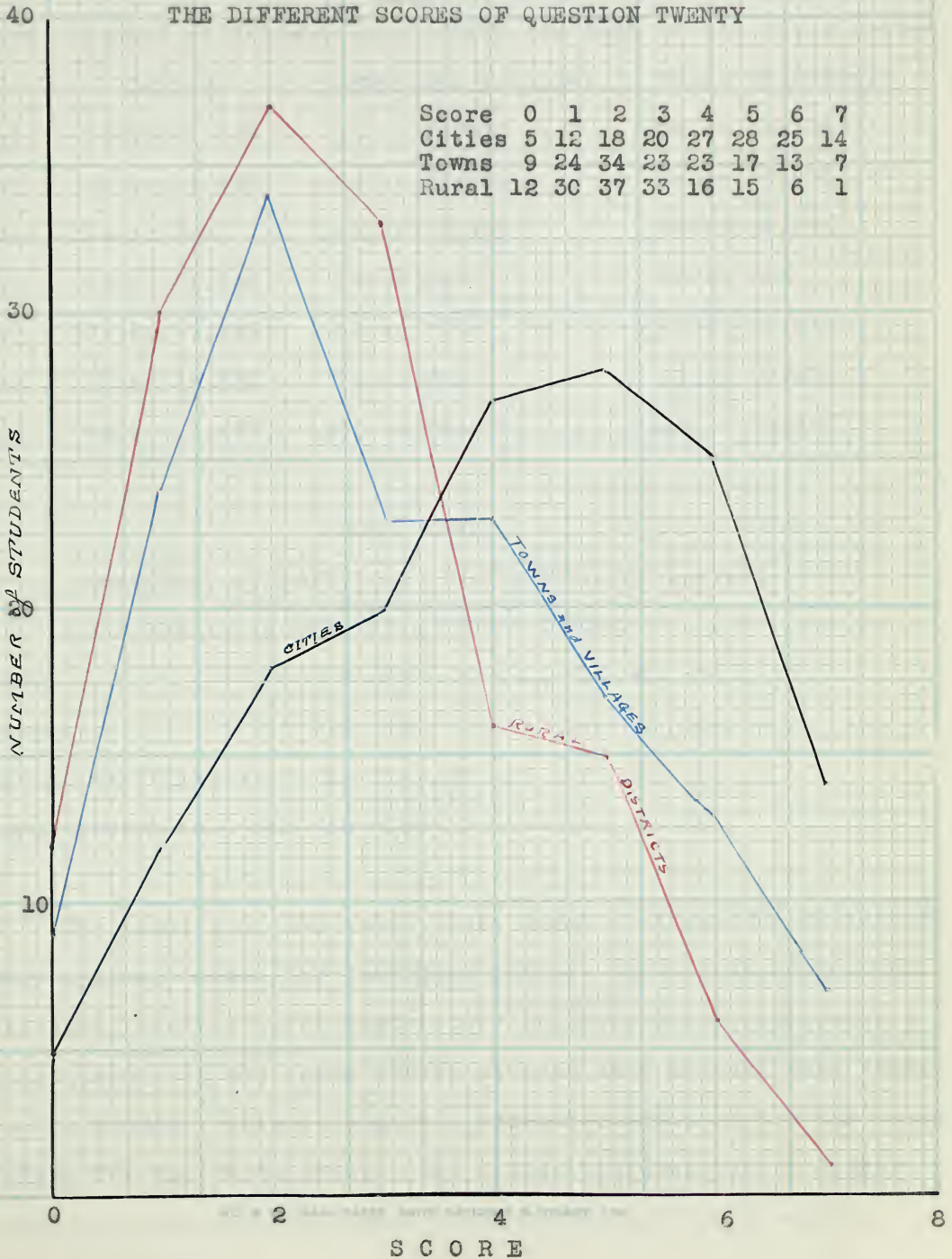
1900

1900

1900

1900

Fig.38-FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION TWENTY



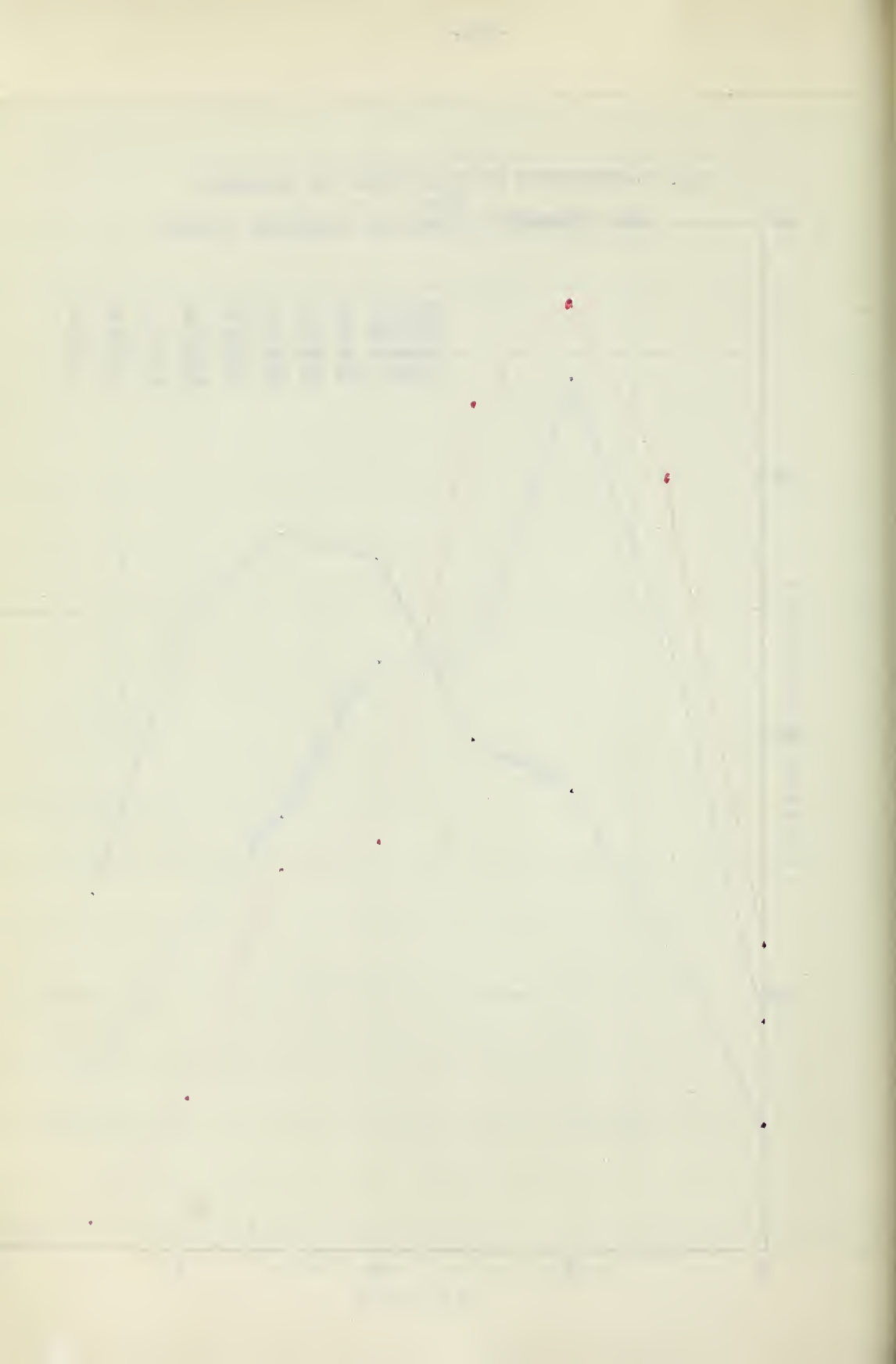


TABLE LXV

FREQUENCY DISTRIBUTION OF STUDENTS (Successful)
for
THE DIFFERENT PARTS OF QUESTION TWENTY

Part	Number of Students out of 150 for each of the three groups.		
	Cities	Towns and Villages	Rural Districts
(a)	94 or 62.67%	61 or 40.67%	38 or 25.33%
(b)	52 or 34.67%	26 or 17.33%	16 or 10.67%
(c)	114 or 76%	92 or 61.33%	85 or 56.67%
(d)	92 or 61.33%	57 or 38%	45 or 30%
(e)	101 or 67.33%	84 or 56%	62 or 41.33%
(f)	68 or 45.33%	39 or 26%	31 or 20.67%
(g)	91 or 60.67%	106 or 70.67%	112 or 74.67%

TABLE LXVI

FREQUENCY DISTRIBUTION OF STUDENTS (Successful)
for
THE DIFFERENT SCORES OF QUESTION TWENTY

Score	0	1	2	3	4	5	6	7
Cities	5	12	18	20	27	28	25	14
Towns and Villages	9	24	34	23	23	17	13	7
Rural Districts	12	30	37	33	16	15	6	1

The results of the above table shown in Figure 38 illustrate very typical curves for the three groups, the Cities, Towns and Villages, and the Rural Districts. ^{Fig. 38} It shows the characteristic relationship of the three curves at both ends and how they cross in the middle. This is almost a perfect example of how the scores behave for the three groups; the author believes that a larger sample of students would make these curves perfectly smooth.

QUESTION TWENTY-ONE
with
ANSWERS

Value

9 21. Directions:

Answer in the spaces at the right the following questions.

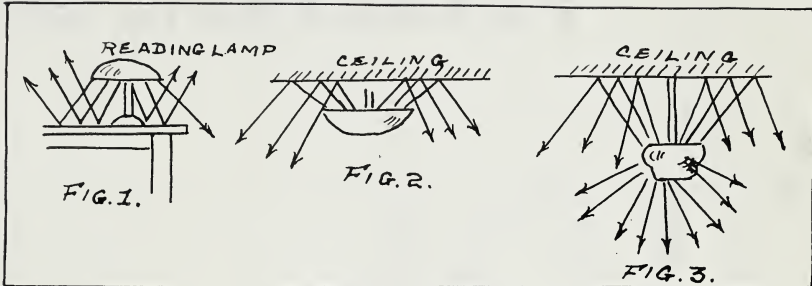
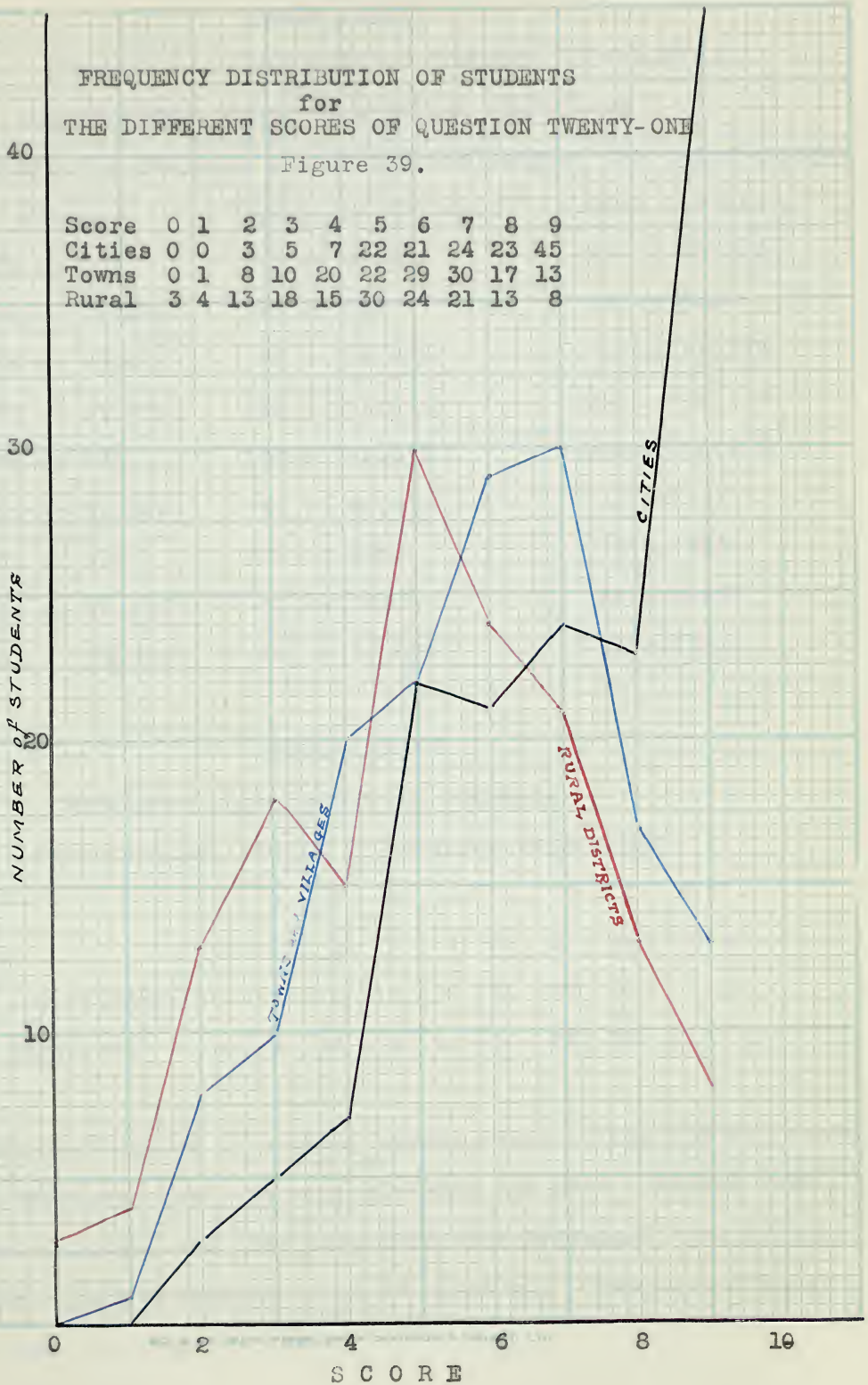


Figure 38a.

- (a) Indirect lighting is shown in figure... (a)...².....
(b) Direct lighting is shown in figure..... (b)...¹.....
(c) Semi-direct lighting is shown in figure (c)...³.....
(d) In which figure is the shade or bowl
opaque? (d)...².....
(1 is also granted a mark)
(e) In which figure is the shade or bowl
translucent? (e)...³.....
(1 is also granted a mark)
(f) When a candle burns the light is caused
by glowing particles of..... (f)...carbon.....
(g) The first incandescent light was in-
vented by..... (g)...Edison.....
(h) The wire-like part in the inside of an
electric bulb is called the (h)...filament.....
(i) When light rays are thrown back from
a surface they are said to be..... (i)...reflected.....

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION TWENTY-ONE
Figure 39.

Score	0	1	2	3	4	5	6	7	8	9
Cities	0	0	3	5	7	22	21	24	23	45
Towns	0	1	8	10	20	22	29	30	17	13
Rural	3	4	13	18	15	30	24	21	13	8



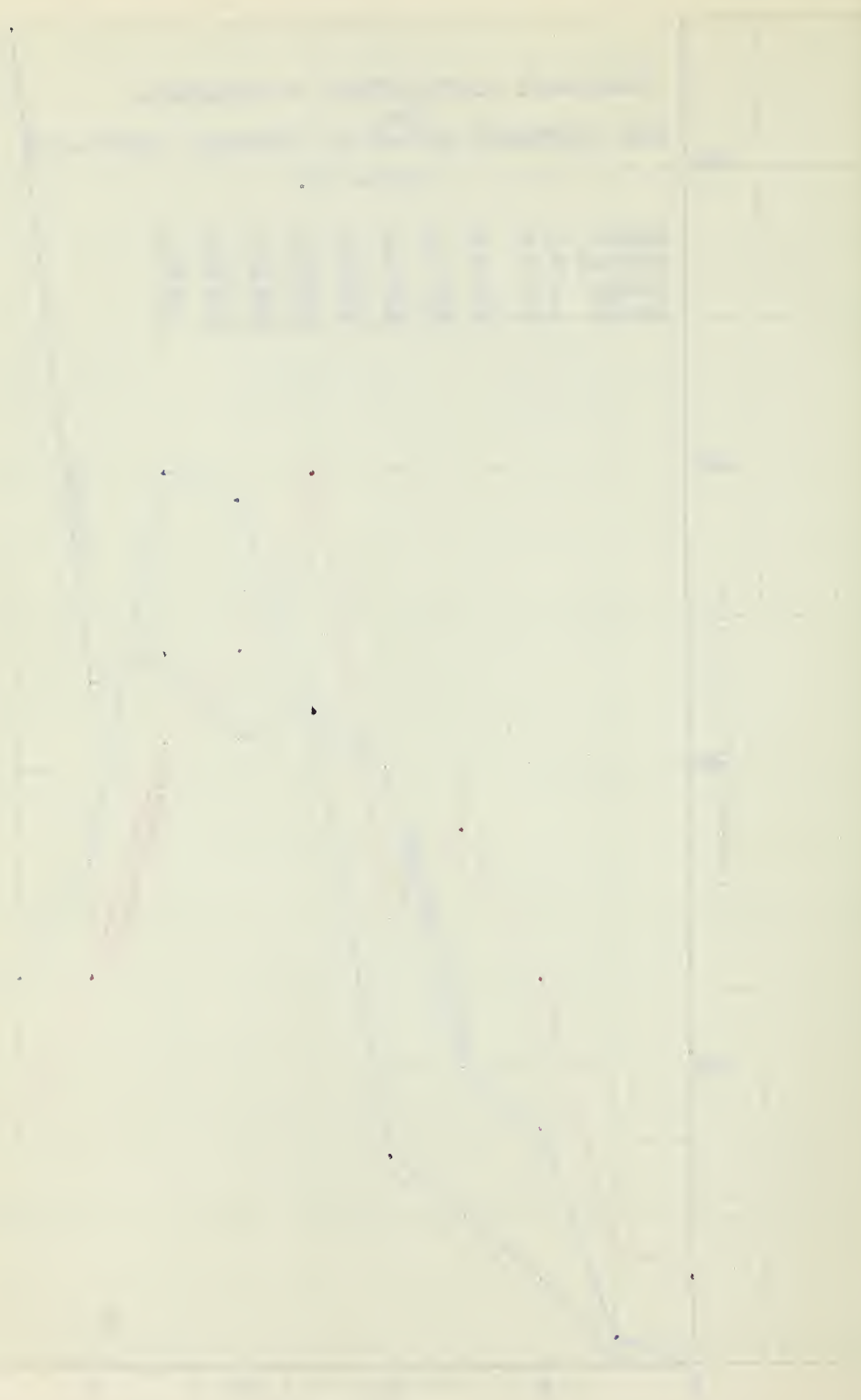


TABLE LXVII

FREQUENCY DISTRIBUTION OF STUDENTS (Successful)
for
THE DIFFERENT PARTS OF QUESTION TWENTY-ONE

Part Number of Students out of 150 for each of the three groups.

	Cities	Towns and Villages	Rural Districts
(a)	129 or 86%	119 or 79.33%	110 or 73.33%
(b)	107 or 71.33%	96 or 64%	75 or 50%
(c)	106 or 70.67%	98 or 65.33%	79 or 52.67%
(d)	122 or 81.33%	103 or 68.67%	104 or 69.33%
(e)	126 or 84%	109 or 72.67%	106 or 70.67%
(f)	119 or 79.33%	91 or 60.67%	69 or 46%
(g)	111 or 74%	78 or 52%	72 or 48%
(h)	110 or 73.33%	90 or 60%	66 or 44%
(i)	113 or 75.33%	91 or 60.67%	84 or 56%

TABLE LXVIII

FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION TWENTY-ONE

Score	0	1	2	3	4	5	6	7	8	9
Cities	0	0	3	5	7	22	21	24	23	45
Towns and Villages	0	1	8	10	20	22	29	30	17	13
Rural Districts	3	4	13	18	15	30	24	21	13	8

Figure 39 shows an unusual upward sweep of the Cities' curve, which indicates that the city students are more familiar with electric lights, and that they have been impressed more by the results of the different types of lighting. These results may have been discussed at home.

CHAPTER IX (Continued)

Question twenty-two is one of the easiest questions on the paper and one with the greatest score value. The principle involved, the convection currents in air, is illustrated by means of arrows which indicate the motion and direction of air. Above the question in the directions the words "hot-air heating" were used. The problem is solved for the student; all he has to do is simply name certain parts of this system and in his own simple language give the use or purpose of each part indicated. The purpose is practically a repetition of the named part, as in the case of the first item. The name of the apart is "cold air return"; the purpose of it is "to return air to furnace for re-heating". If the student had been asked to devise a simple method of heating a small house from the basement, it could have been considered a problem. However, a large number of candidates failed to name the few simple and very common parts of this system.

The following table gives the results:

TABLE LXIX

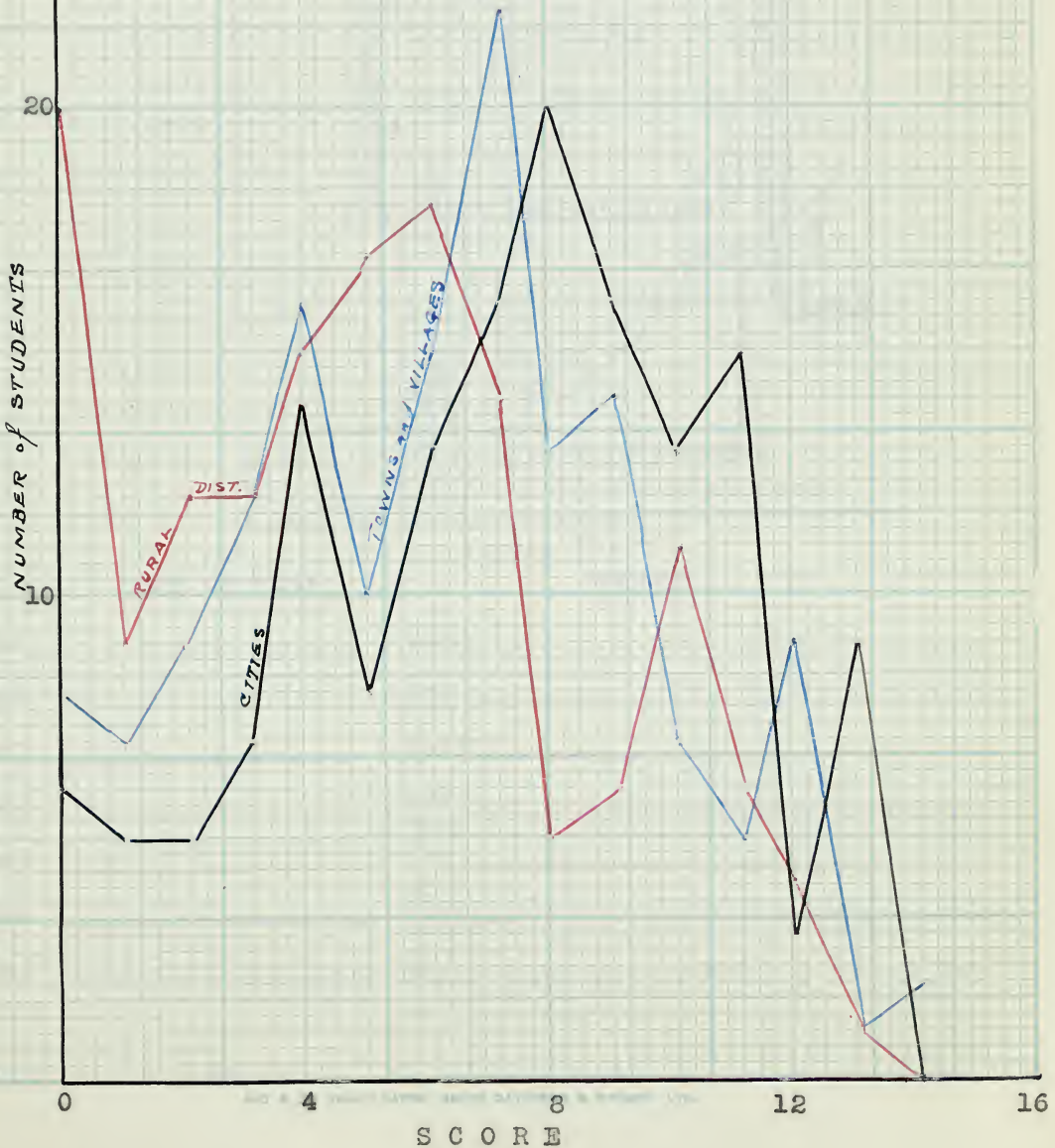
FREQUENCY DISTRIBUTION OF STUDENTS
for
QUESTION TWENTY-TWO

Score	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Cities	6	5	5	7	14	8	13	16	20	16	13	15	3	9	0
Towns & V.	8	7	9	12	15	10	15	22	13	14	7	5	9	1	2
Rural	20	9	12	12	16	17	18	14	5	6	11	6	4	1	0

The graph that follows shows the curves; the cities are high between eight and thirteen, the towns and villages are high at seven, the rural districts are high at zero and six.

Fig.40-FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION TWENTY-TWO

Score	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Cities	6	5	5	7	14	8	13	16	20	16	13	15	3	9	0
Towns	8	7	9	12	16	10	15	22	13	14	7	5	9	1	2
Rural	20	9	12	12	15	17	18	14	5	6	11	6	4	1	0



THEORY OF THE



Question 22. Directions:

Value 14.

Indicate that you know the parts of a hot-air heating system by filling the spaces below. The letters in the columns refer to the letters in the sketch.

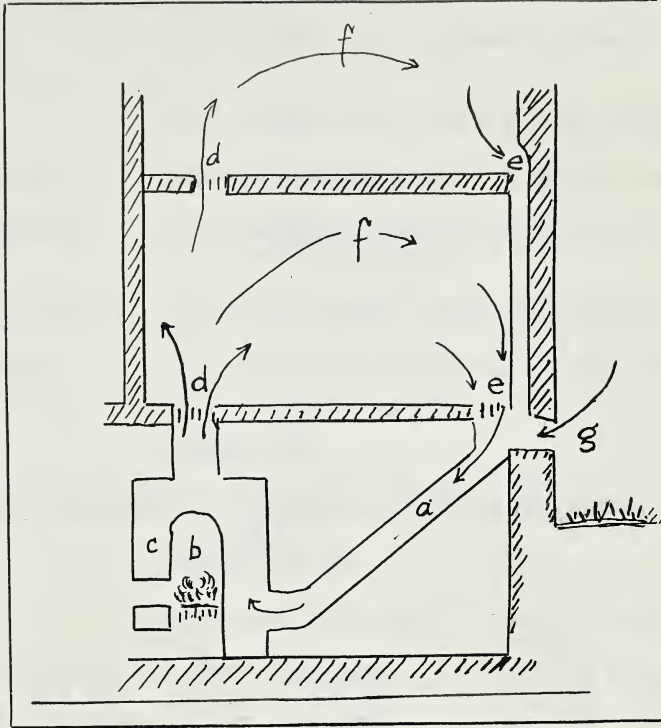


Figure 40a.

NAME OF PART

PURPOSE

(a) _____	(a) _____
(b) _____	(b) _____
(c) _____	(c) _____
(d) _____	(d) _____
(e) _____	(e) _____
(f) _____	(f) _____
(g) _____	(g) _____

ANSWERS to QUESTION 22.

NAME OF PART	PURPOSE
(a) cold air duct; or cold air return.	(a) Returns air to furnace for re-heating.
(b) fire-box	(b) Place for releasing heat from fuel.
air-chamber; or	
(c) air-jacket	(c) Holds air while being heated.
(d) hot-air register	(d) Allows hot air to enter room.
(e) cold-air register	(e) Conducts cooled air from room to cold air duct.
(f) convection currents	(f) Distribute heat throughout the room.
(g) cold-air inlet.	(g) Provides fresh air from outside.

TABLE LXX

DETAILED FREQUENCY DISTRIBUTION OF STUDENTS (Successful)
for
QUESTION 22

Cities	Towns and Villages		Rural Districts	
Name	Name	Name	Name	Name
(a) Name of Part Purpose of Part Purpose	103 or 71 or 88 or	40 or 69 or	61 or 40.67% 68.67% 47.33% 58.67%	26.67% 46%
(b) 79 or 52.67%	85 or 56.67%	61 or 40.67%	80 or 53.33%	55 or 33.33% 75 or 50%
(c) 56 or 37.33%	81 or 54%	31 or 20.67%	62 or 41.33%	22 or 14.67% 55 or 33.33%
(d) 49 or 32.67%	116 or 77.33%	41 or 27.33%	101 or 67.33%	34 or 22.67% 83 or 55.33%
(e) 51 or 34%	101 or 67.33%	36 or 24%	95 or 63.33%	23 or 15.33% 79 or 52.67%
(f) 53 or 35.33%	69 or 46%	47 or 31.33%	66 or 44%	32 or 21.33% 51 or 34%
(g) 60 or 40%	104 or 69.33%	55 or 33.33%	91 or 60.67%	41 or 27.33% 86 or 57.33%
Zero Score 6 or 4%	8 or 5.33%			20 or 13.33%

Some of the percentages in the above table are very low especially in the Rural Districts for such simple names as "air-chamber or air-jacket" and "hot-air register", "cold-air register". There were only 14.67% of the Rural students that answered Part (c) correctly, and 15.33% that had part (e). The highest score or the greatest number of students in the Rural Districts that named any of the parts was only 33.33%, that was for the "fire box". Even Elementary School children should be able to do better than that.

One reason why the results are so poor in the Rural Districts is probably the fact that most of them are not familiar with furnaces; they have heaters in the homes and even in the schools.

Further we may conclude that students, in the study of General Science, should have the object before them to examine its parts and study its operation, in order to remember its parts and the underlying principle. Just reading books and studying diagrams is not good enough; this does not make the same impression on the child's mind as the object itself.

CHAPTER IX (Continued)

Question twenty-three is a review of Grade VII and VIII on Heat and Air. Parts (a) and (b) illustrate the same principle: that heat will change a liquid to vapor and that heat is absorbed as this change takes place. Part (c) simply calls for a recognition of the boiling point on a Centigrade thermometer. Parts (d), (f), (g) and (h) all illustrate the same principle, that pressure depends upon weight or gravity of a substance, in this case water and air. Part (g) calls for the recognition of a barometric reading at sea level in British units of measure. In (h) the column of air weighs less as one goes up and the aneroid barometer is a suitable instrument to measure this difference. Part (e) like (a), (b) and (c) deal with heat, but illustrate the principle of convection currents of water or air as heat is applied.

Many candidates failed to recognize the same principle in (a) and (b) as the following tables and graphs show; roughly only half of the students that had answered (a) had (b) also. There is a marked similarity in the results as the graph of Figure 41 shows, with a slight characteristic skewness to the right for the cities and somewhat less for the towns and villages.

QUESTION 23 WITH CORRECT ANSWERS

Value 8 Directions:

Each question is followed by five alternative answers of which one is the best. In the brackets at the right, place the number of the best answer.

- (a) Water will change to vapor most quickly on days that are -
(1) cold and dry, (2) cold and windy, (3) warm and dry, (4) warm and moist, (5) warm. (a) (...3...)
- (b) When water changes to vapor, it -
(1) gives off heat, (2) absorbs heat, (3) oxidizes, (4) decreases its volume, (5) becomes heavier. (b) (...2...)
- (c) The boiling point of water is -
(1) 273°C, (2) 100°F, 100°C, (4) 4°C, (5) 180°F. (c) (...3...)
- (d) Water pressure at a faucet attached to a pipe which leads from an elevated tank depends upon the of the pipe.
(1) material, (2) height, (3) diameter, (4) volume, (5) suction. (d) (...2....)
- (e) When the temperature of some portion of a body of water is changed,.....will result.
(1) chemical changes, (2) bubbles, (3) evaporation, (4) convection currents, (5) conduction. (e) (...4....)
- (f) Air pressure is due to -
(1) clouds, (2) buoyancy, (3) gravity, (4) sunshine, (5) water vapor. (f) (...3...)
- (g) The height (in inches) of the mercury in an ordinary barometer at sea level is about-
(1) 43, (2) 105, (3) 62, (4) 115, (5) 30. (g) (...5...)
- (h) The instrument by which an aviator determines his altitude is based on the-
(1) thermometer, (2) aneroid barometer, (3) air-speed indicator, (4) magnetic compass, (5) propeller-speed indicator. (h) (...2...)

TABLE LXXI

DETAILED FREQUENCY DISTRIBUTION OF STUDENTS (Successful)
for
QUESTION 23

(a)	Cities	Towns and Villages	Rural Districts
	113 or 75.33%	111 or 74%	103 or 68.67%
(b)	52 " 34.67%	53 " 35.33%	44 " 29.33%
(c)	112 " 74.67%	90 " 60%	86 " 57.33%
(d)	87 " 58%	90 " 60%	85 " 56.67%
(e)	76 " 50.67%	70 " 46.67%	64 " 42.67%
(f)	112 " 74.67%	99 " 66%	91 " 60.67%
(g)	123 " 82%	120 " 80%	96 " 64%
(h)	126 " 84%	121 " 80.67%	121 " 80.67%
Zero Score	1 " 2/3 of 1%	0	3 " 2%

The above table shows the number and percentage of students who had the correct answer for each of the different parts of Question 23. Except for the last two parts, the percentages are very low for this type of question, especially for part (b). The same principle is involved in refrigeration, Grade nine should know that.

Table 1

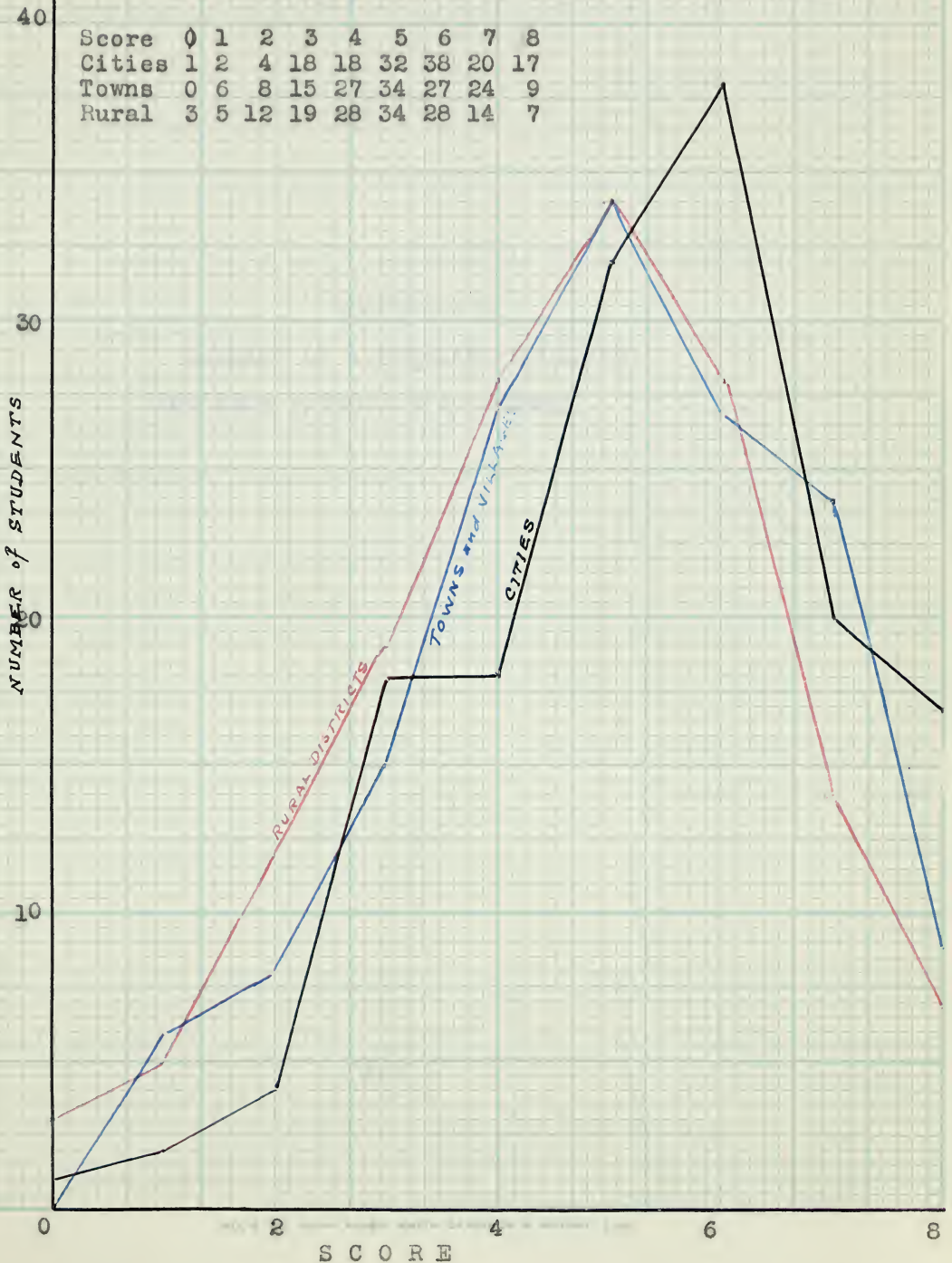
Summary of the results of the experiments conducted during the year 1954, showing the effect of the different treatments on the yield of the various crops.

Treatment	Yield (kg/ha)	Yield (kg/ha)	Yield (kg/ha)
Control	1000	1000	1000
1	1200	1200	1200
2	1400	1400	1400
3	1600	1600	1600
4	1800	1800	1800
5	2000	2000	2000
6	2200	2200	2200
7	2400	2400	2400
8	2600	2600	2600
9	2800	2800	2800
10	3000	3000	3000

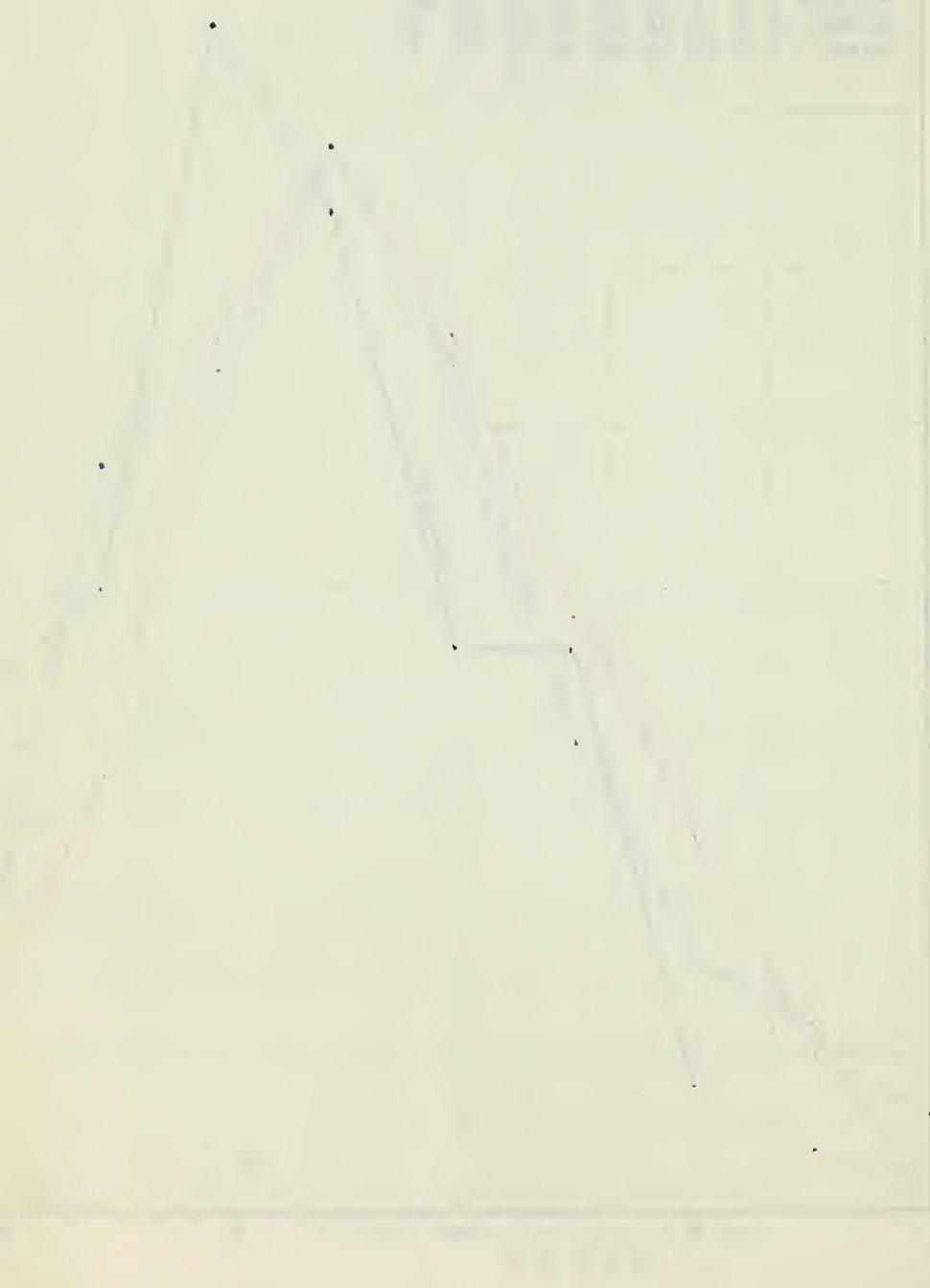
The results of the experiments show that the yield of the various crops is significantly higher in the treated plots than in the control plots. The highest yield was obtained in the plot treated with the highest dose of the treatment, which was 3000 kg/ha. This result is in agreement with the results of other experiments conducted during the same year, which also showed that the yield of the crops is significantly higher in the treated plots than in the control plots.

Fig.41.- FREQUENCY DISTRIBUTION OF STUDENTS
for
THE DIFFERENT SCORES OF QUESTION TWENTY-THREE

Score	0	1	2	3	4	5	6	7	8
Cities	1	2	4	18	18	32	38	20	17
Towns	0	6	8	15	27	34	27	24	9
Rural	3	5	12	19	28	34	28	14	7



ANNALS



CHAPTER X
SUMMARY OF SUCCESSFUL STUDENTS
FOR EACH PRINCIPLE AND SCORE



TABLE LXXII - SUMMARY

PERCENTAGE OF SUCCESSFUL STUDENTS

IN GRADE IX

FOR THE FOLLOWING PRINCIPLES
in
GENERAL SCIENCE AND HEALTH EDUCATION

Question	Principle	Score	Cities	Towns	Rural
1.	Knowing what to do in an emergency				
(a)	Apply cold water to sprained ankle	1. 75.3 2. 8.	75.3 8.	77.3 5.3	75.3 2.7
(b)	Crawling on one's hands and knees out of a smoke-filled room.	1. 49.7 2. 26.7	49.7 26.7	53.3 22.7	51.3 16.7
(c)	Applying a wet dressing to a burn.	1. 34.7 2. 20.7	34.7 20.7	32.7 22.7	23.7 23.7
(d)	Wrapping in warm blankets a person who has fainted.	1. 26.7 2. 7.3	26.7 7.3	30.7 4.7	30. 8.7
(e)	Applying hot compresses to a sty or boil.	1. 24. 2. 0.7	24. 0.7	14.7 2.7	16. 0.7
2.	Keeping Oneself Healthy				
(a)	The best method of preventing pimples or acne is	1. 29.3 2. 69.3	29.3 69.3	34. 63.3	40.7 57.3
(b)	The best way to cultivate friendship is	1. 16. 2. 83.3	16. 83.3	14. 84.7	20.7 78.7
(c)	Good posture and grace of movement are best acquired by	1. 53.3 2. 41.3	53.3 41.3	42. 56.7	52 46
(d)	The best method of combating the housefly is	1. 38.7 2. 60.	38.7 60.	36.7 60.7	44.7 53.3
(e)	Food poisoning is most commonly caused by	1. 69.3 2. 25.3	69.3 25.3	71.3 24.7	77.3 14.7
3.(a)	Taking part in games and sports gives one a better mental outlook on life	1. 55.3 2. 28.7	55.3 28.7	52.7 30.7	53.3 26.7
(b)	What is meant by an "approved hospital" in Alberta?	1. 29.3 2. 29.3	29.3 29.3	26.7 23.3	20. 19.3
(c)	The purpose of the Provincial Health Department. State three ways in which it promotes health.	1. 30.7 2. 45.3 3. 15.3	30.7 45.3 15.3	32. 36.7 16.7	30. 29.3 18.

Question	Principle	Score	Cities	Towns	Rural
4.(1)	Methylene Blue Test for bacteria in milk.	1	50	40	33.3
(2)	Sludge is a solid waste precipitated.	1	62.7	47.3	52.
(3)	Alum is used to create a floc. Example				
(4)	Alcohol increases accidents.	1	83.3	83.3	84
(5)	Candling is done in egg grading	1	91.3	84.7	79.3
(6)	Canada Approved is stamped on meat	1	89.3	75.3	65.3
(7)	Glucose is used as an adulterant in Jam.	1	43.3	29.3	31.3
(8)	Chlorination is done in typhoid control.	1	66.	50.	50.
(9)	Carotene is a source of vitamin A	1	54.7	52.	54.
(10)	Babcock Test is used to measure butter fat.	1	54.	48.	43.3
(11)	Tuberculosis is a disease of young people.	1	74.7	66.	68.7
(12)	Night-blindness is caused by lack of vitamin A.	1	54.	44.	56.
(13)	Metabolism is food combustion.	1	62.	46.7	40.7
5.	Application of the Scientific Method in Daily Life.	0	32.7	28.	38.
		1	35.3	39.3	38.
		2	14.	18.	18.
		3	6.7	7.3	4.
		4	6.	5.3	1.3
		5	1.3	2.	0.7.
		6	2.	0.	0.

Question	Principle	Score	Cities	Towns	Rural
6. (a)	Some ways in which environment affects living things.	0	28.7	36.	33.3
		1	4.	4.7	3.3
		2	4.	1.3	4.7
		3	4.	4.7	5.3
		4	2.	1.3	2.
		5	2.7	1.3	2.7
		6	1.3	0.7	0.
OR (b)	Micro-organisms in Relation to Man and His Environment-	1	12.	17.3	13.3
	<u>The Nitrogen Cycle</u>	2	12.7	18.7	19.3
		3	13.3	6.	8.7
		4	2.7	2.7	2.
		5	6.7	2.	4.
		6	6.7	2.7	2.
7. (a)	Value or Application of the Principles of Science.	0	16.7	16.7	18.7
		1	2.	5.3	8.
		2	12.7	9.3	13.3
		3	10.7	15.3	19.3
		4	25.3	16.7	14.7
		5	15.3	18.7	4.7
		6	9.3	5.3	9.3
OR (b)	Can Science be Responsible for Economic Depression?	1	2.	3.3	4.7
		2	3.3	4.7	4.
		3	2.7	2.7	1.3
		4	0.	0.7	0.7
		5	0.	1.3	1.3
		6	0.7	0.	0.

Question	Principle		Score	Cities	Towns	Rural
8. (a)	Light travels in straight lines	1	15.3	12.	8.	
		2	28.7	34.	22.7	
(b)	Flywheel for control and re- gulation of energy.	1	10.	12.	14.	
		2	21.3	9.3	8.7	
(c)	Asbestos for conservation and control of heat.	1	16.	14.	5.3	
		2	30.	14.	11.3	
(d)	Relation of the speed of light to that of sound.	1	2.7	7.3	6.7	
		2	73.3	53.3	51.3	
(e)	Two holes in a can of milk to equalize air pressure.	1	38.7	48.7	50.7	
		2	27.3	15.3	7.3	
(f)	Siphon - air pressure and gra- vity.	1	43.3	45.3	43.3	
		2	20.	10.7	8.7	
(g)	Inhale oxygen and exhale more of CO ₂ .	1	52.7	58.	52.	
		2	16.	9.3	8.7	
(h)	Magnetism leaves steel when the latter is dissolved in acid	1	21.3	22.7	18.	
		2	17.3	7.3	3.3	
(i)	Reduced air pressure exposes nasal membranes through which the heart presses blood.	1	28.	32.	30.	
		2	30.7	18.	12.7	
9. (a)	Formation of iron oxide or rust.	1	48.7	36.7	24.	
(b)	Expansion of metals.	1	83.3	65.3	43.3	
(c)	Expansion of air.	1	58.7	53.3	52.	
(d)	Demonstration of Osmosis.	1	57.3	48.7	48.7	
10. (a)	Second class lever, the nut- cracker.	1	3.3	6.	6.7	
		2	38.7	32.	22.7	
(b)	Wheel and Axle, bicycle pedals.	1	2.7	4.	7.3	
		2	30.7	34.	18.7	
(c)	Change Fahrenheit to Centigrade reading. (room temperature).	1	0.7	2.7	0.7	
		2	28.7	12.7	8.7	
Zero score for all three parts		0	34.	38.	53.3	

Question	Principle	Score	Cities	Towns	Rural
11. (1)	Pulley (fixed)	1	80.7	84.7	72.7
(2)	" movable	1	79.3	82.7	70.
(3)	Point at which Force is applied.	1	92.7	94.7	90.
(4)	Force necessary to lift object.	1	68.7	66.	50.
(5)	Force.	1	56.	42.7	38.
(6)	Force applied.	1	53.3	40.	44.
(7)	Friction or resistance.	1	40.7	32.	24.7
(8)	Down pull.	1	47.3	56.	47.3
(9)	Effort.	1	56.7	57.3	48.
(10)	Resistance.	1	73.3	74.7	69.3
(11)	Work.	1	79.3	74.7	65.3
(12)	Work done.	1	24.7	21.3	21.3
(13)	Product.	1	4.7	4.7	6.7
(14)	of force	1	8.	7.3	11.3
(15)	and distance.	1	18.	11.	16.
(16)	Rope.	1	66.7	73.3	54.7
(17)	Movement of rope.	1	30.	37.3	32.
12.	Problem Solving Ability.	1	89.3	92.	88.7
		2	46.7	52.	43.3
13.(1)	Bacteria, appearance, shape.	1	94.	93.3	92.
(2)	Cocci or coccus.	1	30.7	30.7	21.3
(3)	Round, dot-shaped.	1	90.7	88.7	84.
(4)	Bacilli or bacillus.	1	32.	28.7	22.7
(5)a.	Rod-shaped bacteria.	1a	93.3	88.7	84.
b.		1b	5.3	0.7	2.
(6)	Spirilla.	1	39.3	31.3	26.

Question	Principle	Score	Cities	Towns	Rural
14.	Microbes or Micro-organisms.				
(a)	small or microscopic	1	64.	60.7	47.3
(b)	Microscope	1	86.7	79.3	70.
(c)	No chlorophyll	1	0.7	4.	2.
(d)	Parasites	1	24.7	34.7	28.7
(e)	Active in moisture	1	16.7	16.	12.
(f)	Fungi	1	6.	5.3	4.7
(g)	Fermentation caused by yeast.	1	42.	41.3	36.
(h)	Spores spoil fruit.	1	22.7	13.3	13.3
15.	Energy				
(a)	Kinetic	1	49.3	44.	36.
(b)	Potential	1	70.	63.3	45.3
(c)	Penstock	1	37.3	34.7	26.7
(d)	Head of water.	1	10.7	6.	2.7
(e)	Shaft of generator.	1	18.	16.7	18.
(f)	1. Volume of water.	1	38.	28.	22.
	2. High head, pressure.	1	27.3	18.	16.7
16.	Change of Energy.				
(1)	Motor changes electrical to mech.	1	72.	60.	63.3
(2)	Friction changes mechanical to heat.	1	28.7	21.3	15.3
(4)	Internal combustion engines change chemical energy to kinetic energy.	1	34.	27.3	24.
(5)	Smoothness reduces friction.	1	71.3	61.3	53.3
(6)	Oars act as levers.	1	84.7	82.	77.3
(7)	Steam engine changes heat energy into mechanical energy.	1	36.	38.	35.3
(8)	Force on piston from rapidly moving molecules of hot gas.	1	53.3	53.3	44.
(9)	Flywheel has much inertia.	1	38.	29.3	18.
(10)	Propellor works like a screw.	1	78.	64.	63.3
(11)	Buoyancy equals the weight of water displaced.	1	93.3	94.	93.3

Question	Principle	Score	Cities	Towns	Rural
17.(a)	Radio - microphone	1	100.	100.	96.
(b)	Speed of radio waves	1	34.3	32.	24.7
(c)	Simplest form of detector, crystal	1	23.3	8.	10.7
(d)	Static	1	82.7	79.3	71.3
(e)	Electrons in radio vacuum tubes.	1	10.7	2.	0.
18.	Connecting electrical wires to cell, bell, and push button.	0 1 2 3	63.3 5.3 7.3 32.7	70. 6. 7.3 16.7	78.7 6.7 7.3 7.3
19.	Telephone				
(a)	Inventor, Alexander Graham Bell	1	95.3	92.7	90.7
(b)	Transmitter.	1	46.7	31.3	22.7
(c)	Receiver.	1	86.7	79.3	65.3
(d)	Electric energy changed to mechanical.	1	76.7	68.	66.
(e)	Mouthpiece.	1	95.3	95.3	92.
(f)	Magnetic core.	1	47.3	37.3	26.
(g)	Carbon granules or button.	1	89.3	76.	59.3
(h)	Electro-magnet.	1	68.	61.3	53.3
20.	ELECTROPLATING				
(a)	Connection of object.	1	62.7	40.7	25.3
(b)	Electrolyte.	1	34.7	17.3	10.7
(c)	Copper bar for copper plating.	1	76.	61.3	56.7
(d)	Electrolyte.	1	61.3	38.	30.
(e)	Positive pole.	1	67.3	56.	41.3
(f)	Cells connected in series.	1	45.3	26.	20.7
(g)	Chemical energy used.	1	60.7	70.7	74.7

Question	Principle	Score	Cities	Towns	Rural
21.	Lighting.				
(a)	Indirect	1	86.	79.3	73.3
(b)	Direct	1	71.3	64.	50.
(c)	Semi-direct	1	70.7	65.3	52.7
(d)	Opaque shade	1	81.3	68.7	69.3
(e)	Translucent shade	1	84.	72.7	70.7
(f)	Glowing carbon particles.	1	79.3	60.7	46.
(g)	First incandescent light, Edison	1	74.	52.	48.
(h)	Filament, wire inside bulb.	1	73.3	60.	44.
(i)	Reflected light.	1	75.3	60.7	56.
22.	Hot-air Heating System				
(a)	1. Cold air duct.	1	40.7	47.3	26.7
	2. Purpose	1	68.7	58.7	46.
(b)	1. Fire-box	1	52.7	40.7	33.3
	2. Purpose	1	56.7	53.3	50.
(c)	1. Air jacket	1	37.3	20.7	14.7
	2. Purpose	1	54.	41.3	33.3
(d)	1. Hot-air register	1	32.7	27.3	22.7
	2. Purpose	1	77.3	67.3	55.3
(e)	1. Cold-air register	1	34.	24.	15.3
	2. Purpose	1	67.3	63.3	52.7
(f)	1. Convection currents	1	35.3	31.3	21.3
	2. Purpose	1	46.	44.	34.
(g)	1. Cold-air inlet	1	40.	33.3	27.3
	2. Purpose	1	69.3	60.3	57.3
23.	(a) Water changes to vapor most quickly on warm days.	1	75.3	74.	68.7
	(b) Absorbs heat when changing to vapor.		34.7	35.3	29.3
	(c) Boiling point is at 100° C.	1	74.7	60.	57.3
	(d) Pressure depends on height.	1	58.	60.	56.7
	(e) Change of temperature causes convection currents.	1	50.7	46.7	42.7
	(f) Air pressure is due to gravity.	1	74.7	66.	60.7
	(g) Height of mercury in a barometer at sea level is 30 inches.		82.	80.	64.
	(h) Aneroid barometer used as altimeter.		84.	80.7	80.7

TABLE LXXIII

AVERAGE OF THE PERCENTAGES
of
SUCCESSFUL STUDENTS
for
EACH MAIN PRINCIPLE

Question:	Principle	Score	Cities	Towns	Rural
1.	Knowing what to do in an emergency	10	27.4	26.7	24.8
2.	Keeping oneself healthy.	10	48.6	48.8	48.5
3.	Games and Sports; "approved hospital" The purpose of the Provincial Health Dept.	7	33.4	31.3	28.1
4.	Review of a number of principles.	12	66.3	55.5	54.8
5.	Application of the Scientific Method in Daily Life.	6	10.9	12.	10.3
6.	Some ways in which environment affects living things; The Nitrogen Cycle.	12. 6		10.6	11.2
7.	Value or Application of the Prin- ciples of Science.	6	14.	13.9	13.6
8.	Light; Flywheel; Asbestos; Sound; Air- pressure; Respiration; Magnetism.	18	27.4	23.5	20.2
9.	Iron oxide; Expansion of metals and air; Osmosis.	4.	62.	51.	42.
10.	Lever; Wheel and Axle; Temperatures.	6	17.5	15.2	9.8
11.	Pulley	17	51.8	50.6	44.2
12.	Problem Solving Ability.	2	68.	72.	66.
13.	Bacteria.	7	55.	51.7	47.4
14.	Microbes or Micro-organisms.	8	32.9	31.8	28.8
15.	Energy.	7	35.8	30.1	23.9
16.	Change of Energy.	10	58.9	53.1	48.7
17.	Radio.	5	50.2	44.3	40.5
18.	Connecting electric wires.	3	15.1	10.	7.1
19.	Telephone.	8	75.7	67.7	59.4
20.	Electroplating.	7	58.3	44.5	37.5
21.	Lighting.	9	77.2	64.8	56.7
22.	Hot-air Heating System.	14	50.9	43.8	35.
23.	Water vapor, etc.	8	66.8	62.8	57.5

Fig.42- AVERAGE OF THE PERCENTAGES
of
SUCCESSFUL STUDENTS
for
EACH MAIN PRINCIPLE

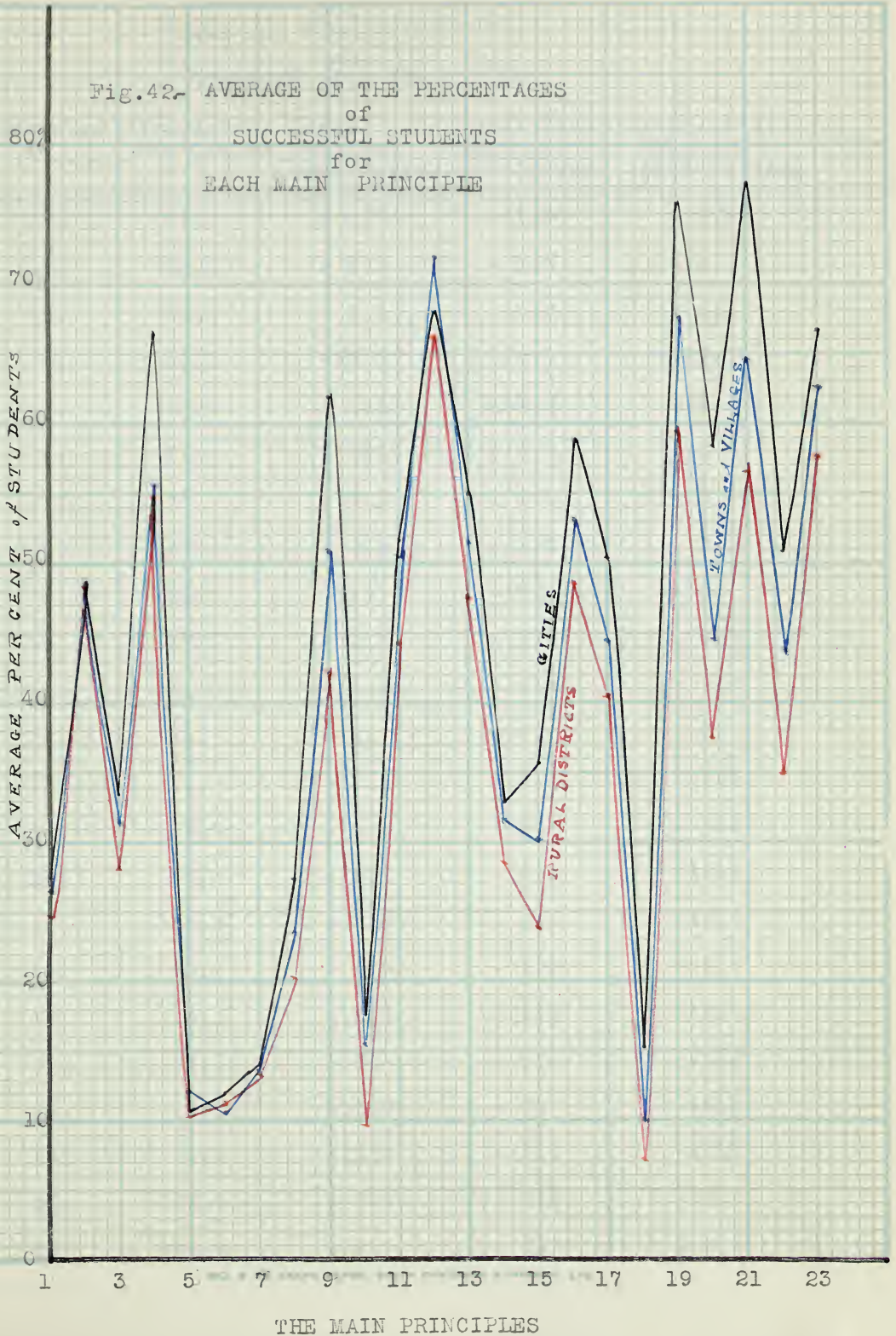


TABLE LXXIV
DIFFERENCES OF AVERAGE PERCENTAGES
for
TOWNS and RURAL DISTRICTS
as
COMPARED with the CITIES

Question	Average for Cities	Towns Compared with Cities	Rural Dist. Compared with Towns	Rural Dist. Compared with Cities.
1.	27.4	- 0.7	- 1.9	- 2.6
2.	48.6	+ 0.2	- 0.3	- 0.1
3.	33.4	- 2.1	- 3.2	- 5.3
4.	66.3	-10.8	- 0.7	-11.5
5.	10.9	+ 1.1	- 1.7	- 0.6
6.	12.	- 1.4	+ 0.6	- 0.8
7.	14.	- 0.1	- 0.3	- 0.4
8.	27.4	- 3.9	- 3.3	- 7.2
9.	62.	-11.	- 9.	-20.
10.	17.5	- 2.3	- 5.4	- 7.7
11.	51.8	- 1.2	- 6.4	- 7.6
12.	68.	+ 4.	- 6.	- 2.
13.	55.	- 3.3	- 4.3	- 7.6
14.	32.9	- 1.1	- 3.	- 4.1
15.	35.8	- 5.7	- 6.2	-11.9
16.	58.9	- 5.8	- 4.4	-10.2
17.	50.2	- 5.9	- 3.8	- 9.7
18.	15.1	- 5.1	- 2.9	- 8.
19.	75.7	- 8.	- 8.3	-16.3
20.	58.3	-13.8	- 7.	-20.8
21.	77.2	-12.4	- 8.1	-20.5
22.	50.9	- 7.1	- 8.8	-15.9
23.	66.8	- 4.	- 5.3	- 9.3

CHAPTER X (Continued)
SUMMARY OF SCORES (PER CENT)
RECEIVED BY EACH PRINCIPLE

TABLE LXXV
PERCENTAGE SCORES
for
THE FOLLOWING PRINCIPLES
in
GENERAL SCIENCE AND HEALTH EDUCATION

Question	Principle	Cities	Towns	Rural
1.	Knowing what to do in an emergency			
(a)	Apply cold water to sprained ankle	45.7	44.	40.3
(b)	Crawling on one's hands and knees out of a smoke-filled room.	51.3	49.3	42.3
(c)	Applying a wet dressing to a burn.	38.	39.	37.
(d)	Wrapping in warm blankets a person who has fainted.	20.7	20.	23.7
(e)	Applying hot compresses to a sty or boil.	12.7	10.	8.7
2.	Keeping Oneself Healthy			
(a)	The best method of preventing pimples or acne.	84.	80.3	77.7
(b)	The best way to cultivate friendship.	91.3	91.7	89.
(c)	How good posture and graceful movement are best acquired.	68.	77.7	72.
(d)	The best method of combat ing the housefly.	79.3	79.	75.7
(e)	How food poisoning is most commonly caused.	60.	60.3	53.3
3. (a)	Taking part in games and sports gives one a better mental outlook on life.	56.3	57.	53.3
(b)	What is meant by an "approved hospital" in Alberta?	44.	36.7	29.3
(c)	The purpose of the Provincial Health Department. State three ways in which it promotes health.	55.8	51.8	47.6

Question	Principle	Cities	Towns	Rural
4.(1)	Methylene Blue Test for bacteria in milk.	50	40	33.3
(2)	Sludge is a solid waste precipitated.	62.7	47.3	52.
(3)	Alum is used to create a floc.	Example.		
(4)	Alcohol increases accidents.	83.3	83.3	84.
(5)	Candling is done in egg grading.	91.3	84.7	79.3
(6)	Canada Approved stamped on meat.	89.3	75.3	65.3
(7)	Glucose is used as adulterant in jam.	43.3	29.3	31.3
(8)	Chlorination as typhoid control. .	66.	50.	50.
(9)	Carotene is a source of vitamin A.	54.7	52.	54.
(10)	Babcock Test to measure butter fat.	54.	48.	43.3
(11)	Tuberculosis, a disease of young people	74.7	66.	68.7
(12)	Night-blindness due to the lack of Vitamin A.	54..	44.	56.
(13)	Metabolism is food combustion.	62.	46.7	40.7
5.	Application of the Scientific Method.	21.3	21.4	15.8
6.	Environment Affects Living Things.	8.9	6.2	8.3
OR.	Micro-organisms, The Nitrogen Cycle.	26.9	18.2	19.7
7.	Application of Principles of Science.	46.7	43.7	38.4
OR.	Science and Economic Depressions.	3.4	5.	4.3
8.(a)	Light travels in straight lines.	36.3	40.	26.7
(b)	Flywheel for control of energy.	26.3	15.3	15.7
(c)	Asbestos for the control of heat.	38.	21.	14.
(d)	Speed of light and of sound.	74.7	57.	54.7
(e)	Air pressure, two holes in can.	46.7	39.7	32.7
(f)	Siphon- air pressure and gravity.	41.7	33.3	30.3
(g)	Exhaled air has more CO ₂ than inhaled.	42.3	38.3	34.7
(h)	No magnetism in dissolved steel.	28.	18.7	12.3
(i)	Reduced air-pressure, nosebleed.	44.7	34.	27.7

Question	Principle	Cities	Towns	Rural
9. (a)	Formation of iron oxide or rust.	48.7	36.7	24.
(b)	Expansion of metals.	83.3	65.3	43.3
(c)	Expansion of air.	58.7	53.3	52.
(d)	Demonstration of Osmosis.	57.3	48.7	48.7
10. (a)	Second class lever, the nutcracker.	40.3	35.	26.
(b)	Wheel and Axle, bicycle pedals.	32.	36.	22.3
(c)	Change Fahrenheit to Centigrade reading. (Room temperature).	33.8	28.3	19.1
11. (1)	Pulley (fixed)	80.7	84.7	72.7
(2)	" movable.	79.3	82.7	70.
(3)	Point at which Force is applied.	92.7	94.7	90.
(4)	Force necessary to lift object.	68.7	66.	50.
(5)	Force.	56.	42.7	38.
(6)	Force applied.	53.3	40.	44.
(7)	Friction or resistance.	40.7	32.	24.7
(8)	Down pull.	47.3	56.	47.3
(9)	Effort.	56.7	57.3	48.
(10)	Resistance.	73.3	74.7	69.3
(11)	Work.	79.3	74.7	65.3
(12)	Work done.	24.7	21.3	21.3
(13)	Product	4.7	4.7	6.7
(14)	of force	8.	7.3	11.3
(15)	and distance.	18.	11.	16.
(16)	Rope.	66.7	73.3	54.7
(17)	Movement of rope.	30.	37.3	32.
12.	Problem Solving Ability.	67.7	71.7	66.
13. (1)	Bacteria, shapes or forms.	94.	93.3	92.
(2)	Cocci or coccus.	30.7	30.7	21.3
(3)	Round, dot-shaped.	90.7	88.7	84.

Question	Principle	Cities	Towns	Rural
13.(4)	Bacilli or bacillus	32.	28.7	22.7
(5)	Rod-shaped bacteria.	49.3	44.7	43.
(6)	Spirilla.	39.3	31.3	26.
14.(a)	Microbes or Micro-organisms, small.	64.	60.7	47.3
(b)	Microscope.	86.7	79.3	70.
(c)	No chlorophyll.	.7	4.	2.
(d)	Parasites.	24.7	34.7	28.7
(e)	Active in moisture.	16.7	16.	12.
(f)	Fungi.	6.	5.3	4.7
(g)	Fermentation caused by yeast.	42.	41.3	36.
(h)	Spores spoil fruit.	22.7	13.3	13.3
15.(a)	Energy- Kinetic.	49.3	44.	36.
(b)	Potential	70.	63.3	45.3
(c)	Penstock.	37.3	34.7	26.7
(d)	Head of water.	10.7	6.	2.7
(e)	Shaft of generator.	18.	16.7	18.
(f)	1. Volume of water.	38.	28.	22.
	2. High head, pressure.	27.3	18.	16.7
16.	CHANGE of ENERGY.			
(1)	Motor changes electrical to mech.	72.	60.	63.3
(3)	Friction changes mechanical to heat.	28.7	21.3	15.3
(4)	Gas engine changes chemical to kinetic	34.	27.3	24.
(5)	Smoothness reduces friction.	71.3	61.3	53.3
(6)	Oars act as levers.	84.7	82.	77.3
(7)	Steam engine, heat to mechanical.	36.	38.	35.3
(8)	Rapidly moving molecules of hot gases cause force on piston.	53.3	53.3	44.
(9)	Flywheel has much enertia.	38.	29.3	18.
(10)	Propeller works like a screw.	78.	64.	63.3
(11)	Buoyancy, weight of water displaced.	93.3	94.	93.3

Question	Principle	Cities	Towns	Rural
17.(a)	Radio - microphone.	100.	100.	96.
(b)	Speed of radio waves.	34.3	32.	24.7
(c)	Crystal, simplest form of detector.	23.3	8.	10.7
(d)	Static.	82.7	79.3	71.3
(e)	Electrons in radio vacuum tubes.	10.7	2.	0.
18.	Connecting electrical wires to cell, bell, and push button.	38.7	23.6	14.4
19.	TELEPHONE			
(a)	Inventor, Alexander Graham Bell	95.3	92.7	90.7
(b)	Transmitter.	46.7	31.3	22.7
(c)	Receiver.	86.7	79.3	65.3
(d)	Electrical energy changed to mechanical.	76.7	68.	66.
(e)	Mouthpiece.	95.3	95.3	92.
(f)	Magnetic core.	47.3	37.3	26.
(g)	Carbon granules or button.	89.3	76.	59.3
(h)	Electro-magnet.	68.	61.3	53.3
20.	ELECTROPLATING.			
(a)	Connection of object.	62.7	40.7	25.3
(b)	Electrolyte.	34.7	17.3	10.7
(c)	Copper bar for copper plating.	76.	61.3	56.7
(d)	Electrolyte.	61.3	38.	30.
(e)	Positive pole.	67.3	56.	41.3
(f)	Cells connected in series.	45.3	26.	20.7
(g)	Chemical energy used.	60.7	70.7	74.7

Question	Principle	Cities	Towns	Rural
21.	LIGHTING			
(a)	Indirect	86.	79.3	73.3
(b)	Direct	71.3	64.	50.
(c)	Semi-direct	70.7	65.3	52.7
(d)	Opaque shade	81.3	68.7	69.3
(e)	Translucent shade	84.	72.7	70.7
(f)	Glowing carbon particles.	79.3	60.7	46.
(g)	First incandescent light, Edison.	74.	52.	48.
(h)	Filament, wire inside bulb.	73.3	60.	44.
(i)	Reflected light	75.3	60.7	56.
22.	HOT-AIR HEATING SYSTEM			
(a)	Cold-air duct	54.7	53.	36.3
(b)	Fire-box	55.2	47.	41.7
(c)	Air jacket	45.7	31.	24.
(d)	Hot-air register	55.	47.3	39.
(e)	Cold-air register	50.7	43.7	34.
(f)	Convection currents	40.7	37.7	27.7
(g)	Cold-air inlet	54.7	47.	42.3
23.	(a) Water will change to vapor most quickly on days that are warm and dry.	75.3	74.	68.7
	(b) Heat is absorbed when water changes to vapor.	34.7	35.3	29.3
	(c) The boiling point of water is 100°C.	74.7	60.	57.3
	(d) Water pressure in a pipe depends upon the height of an elevated tank.	58.	60.	56.7
	(e) Change of temperature of some portion of a body of water causes convection currents.	50.7	46.7	42.7
	(f) Air pressure is due to gravity.	74.7	66.	60.7
	(g) Height of mercury in a barometer at sea level is 30 inches.	82.	80.	64.
	(h) An aneroid barometer may be used as an altimeter.	84.	80.7	80.7

TABLE LXXVI
AVERAGE SCORE (PER CENT)
for
EACH MAIN PRINCIPLE

Question	Principle	Score	Cities	Towns	Rural
1.	Knowing what to do in an emergency	10	33.7	32.5	30.4
2.	Keeping oneself healthy.	10	76.5	77.8	73.5
3.	Games and Sports; "approved hospital	7	52.6	49.	44.
4.	The purpose of Provincial Health Dept. Review of a number of principles.	12	66.3	55.5	54.8
5.	Application of the Scientific Method in Daily Life.	6	21.3	21.4	15.8
6.	Some ways in which environment affects living things; The Nitrogen Cycle.	6	35.8	24.3	27.4
7.	Value or Application of the Prin- ciples of Science.	6	51.6	48.6	42.8
8.	Light; Wheel; Asbestos; Sound; Air- pressure; Respiration; Magnetism.	18	42.2	33.	27.6
9.	Iron oxide; Expansion of metals and air; Osmosis.	4	62.	51.	42.
10.	Lever; Wheel and Axle; Temperature	6	33.8	28.3	19.1
11.	Pulleys	17	51.8	50.6	44.2
12.	Problem Solving Ability.	2	68.	72.	66.
13.	Bacteria.	7	55.	51.7	47.4
14.	Microbes or Micro-organisms.	8	32.9	31.8	28.8
15.	Energy.	7	35.8	30.1	23.9
16.	Change of Energy.	10	58.9	53.1	48.7
17.	Radio.	5	50.2	44.3	40.5
18.	Connecting Electric Wires.	3	38.7	23.6	14.4
19.	Telephone.	8	75.7	67.7	59.4
20.	Electroplating.	7	58.3	44.5	37.5
21.	Lighting.	9	77.2	64.8	56.7
22.	Hot-air Heating System.	14	50.9	43.8	35.
23.	Water vapor; Heat; Water pressure; Convection currents; Gravity; Aneroid barometer.	8	66.8	62.8	57.5

Fig. 43.- AVERAGE SCORE (PER CENT)
for
EACH MAIN PRINCIPLE

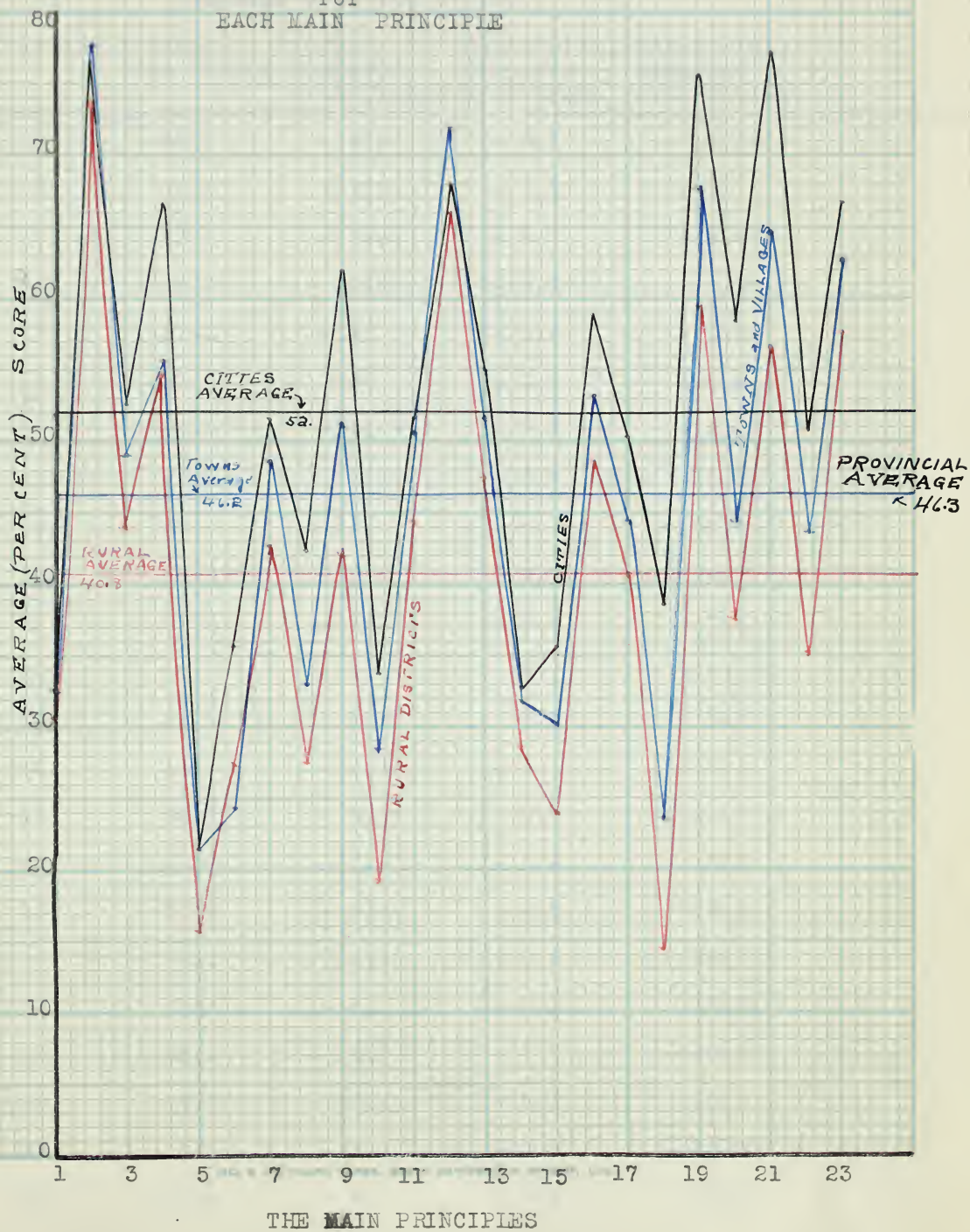


TABLE LXXVII
DIFFERENCES OF AVERAGE SCORES
for
TOWNS and RURAL DISTRICTS
as
COMPARED with the CITIES

Question	Average for Cities	Towns Compared with Cities	Rural Dist. Compared with Towns	Rural Dist. Compared with Cities.
1.	33.7	- 1.2	- 2.1	- .3.3
2.	76.5	+ 1.3	- 4.3	- 3.
3.	52.6	- 3.6	- 5.	- 8.6
4.	66.3	- 10.8	- 0.7	- 11.5
5.	21.3	+ .1.	- 5.6	- 5.5
6.	35.8	-11.5	+ 3.1	- 8.4
7.	51.6	- 3.	- 5.8	- 8.8
8.	42.2	- 9.2	- 5.4	- 14.6
9.	62.	- 11.	- 9.	- 20.
10.	33.8	- 5.5	- 9.2	- 14.7
11.	51.8	- 1.2	- 6.4	- 7.6
12.	68.	+ 4.	- 6.	- 2.
13.	55.	- 3.3	- 4.3	- 7.6
14.	32.9	- 1.1	- 3.	- 4.1
15.	35.8	- 5.7	- 6.2	- 11.9
16.	58.9	- 5.8	- 4.4	- 10.2
17.	50.2	- 5.9	- 3.8	- 9.7
18.	38.7	- 15.1	- 9.2	- 24.3
19.	75.7	- 8.	- 8.2	- 16.3
20.	58.3	- 13.8	- 7.	- 20.8
21.	77.2	- 12.4	- 8.1	- 20.5
22.	50.9	- 7.1	- 8.8	- 15.9
23.	66.8	- 4.	- 5.3	- 9.3

TABLE LXXVIII
COMPARISON OF TOWNS AND RURAL DISTRICTS
with
CITIES

	Cities	Towns and Villages	Rural Districts
General Average	52%	46.2%	40.8%
Differences As Compared With Cities		-5.6%	-11.2%
Difference As Compared With Towns And Villages			-5.4%

Provincial Average, or that of the above three, is 46.3

It is apparent that a constant relationship exists between Towns-Villages and Cities, and between Rural Districts and Towns-Villages; or the difference between Rural Districts and Cities is double that of the Towns-Villages and Cities. Any deviation from this constant relationship is believed to be due to the limited sample of this investigation.

This relationship is shown in Twenty One of the Twenty Three graphs of the Scores for the Different Questions. Number twelve shows the Towns and Villages above the Cities, while number Twenty one is extremely high for the Cities in the last figure, otherwise this one also follows a constant trend.

The graph of Figure 43 shows the Black Line as much above the Blue Line as the Red one is below the Blue, and the Provincial Average follows the Blue Line.

CHAPTER XI

CONCLUSIONS

The investigation has been of great interest to the writer; many interesting facts have come to light about the course in General Science and Health, and about the Final Examination in General Science and Health Education of 1940. The marks of this examination are low; for thirteen of the twenty-three questions, the average score is below fifty per cent. Three questions are below twenty per cent and three more below thirty per cent for the rural districts.

The Median for the Province is 45.1 per cent, while the average is 46.3 per cent. This indicates a slight skewness, a departure from symmetry of the distribution of students for the different scores. The Median Score for the rural districts is only 39.7 per cent.

Sigma (σ), the Standard Deviation for the Province, in terms of per cent is 11.6, which means that two-thirds of the students have a score between 33.5 ($45.1 - 11.6$) and 56.7 ($45.1 + 11.6$) per cent. One-sixth of the students have a score between 33.5 and 16 per cent, and the other sixth have a score between 56.7 and 79 per cent.

The most outstanding fact about the investigation is the relationship of the three groups under investigation: the city, town and village, and rural districts; their differences are marked and regular, see Tables LXXVI, LXXVII and LXXVIII also Figure 43.

The following are the findings of the foregoing investigation.

- (1) A definite relationship exists among the scores of the city, town and village, and rural districts.
- (2) The students have not been taught to use the Scientific Method in solving problems.
- (3) The answer given by the student depended on the wording of the question.
- (4) Little or no transfer of knowledge is evident.
- (5) Some questions are too advanced for the grade.
- (6) In other questions, everything is done for the pupil.
- (7) The principles involved are often not revealed in the answer.
- (8) The examinations still require a list of facts and terms to be memorized.
- (9) The textbooks in Grade IX are too advanced.
- (10) Libraries of these advanced books would be of little value.
- (11) The method of teaching as given in the Programme of Studies is difficult to apply.
- (12) The course in General Science and Health Education is too long for a careful study.
- (13) We lack laboratory facilities.
- (14) Classes should be smaller for laboratory work.
- (15) We need longer laboratory periods.
- (16) Actual experience in manipulating a machine makes it real.

A constant relationship apparently exists among the scores of the city, town and village, and rural districts. The difference between the city and town and village districts is practically equal to the difference between the town and village and the rural districts, or the difference between the city and the rural districts is double the difference between the city and the town and village districts. Any deviation from this relationship is believed to be due to the limited sample of this investigation or some special incident. This relationship is illustrated by twenty-one of the twenty-three graphs for the different problems. Invariably the curve for the cities is low for the small scores and high for the large scores. The red curve for the rural districts runs opposite to the black one; it is high for the small scores and low for the large scores. The general tendency for the blue line, which represents the town and village districts, is to be half way between the black and the red lines. Questions two and twelve may be regarded as special cases. In both instances the town and village districts are above the cities in their scores. The reason why the town and village districts are so high in their scores, and even the rural districts are higher than usual, may be that these localities lack facilities for physical training. Therefore, all the time allotted for Health Education may have been spent on the theory. Then in connection with question twelve, many of the students in town and village districts may have had occasion to write to the Department of Agriculture for similar information. This would not be the case in the cities.

The conclusion that the author draws from his results is that the sum total of conditions in schools, environment, equipment, etc., of the town and village districts is as much superior to the rural districts as that of the city districts is superior to the town and village districts. Those who are familiar with rural life, as the author is, know that a child's success or failure is measured by his achievements on the farm rather than those in school; whereas, in the cities the child's life centers around the school.

The results of question five were a clear evidence that the students over the whole province were not solving their problems in General Science by the Scientific Method. Of course, it may be true that too much stress was laid on the word "Essay". The directions definitely call for an essay in three different places. As a result over eighty per cent of the students had essays from one-half to one page in length, according to instructions.

The third and fourth points may be taken together. The results of this investigation clearly indicate that the students in the Intermediate Schools are unable to apply the General Principles they have studied earlier to the solving of new problems. Much depended on the wording of the questions; any deviations from the textbooks confused the pupils. For this reason it was often difficult to state whether the students did or did not know the General Principles involved. In the case of the multiple choice and the matching problems, the scores are invariably high. This indicates that the students know the answers even though they are not able to express them correctly. There are five questions that prove

this point, numbers two, four, twelve, sixteen and twenty-three. The students like these questions because very little thinking and no planning is involved.

The opposite to these questions is the "Essay Type" in Part II. In this section the marks are very low, especially for question five. In this question the student is asked to do a number of things: first, to decide whether he is to state his answer in a definite form, the Scientific Method, or to write an essay, as over eighty per cent of the students did; second, to use the Scientific Method; third, to plan his work; fourth, to answer a question that is not taken from a textbook, or in other words, to apply the principles he had studied earlier to the solving of a new problem. A third of the students simply did not try this question at all. The two-thirds that made an attempt received less than one-fifth of the total score.

With the exception of the first question, the Health Education part of the paper is well answered. For question one, most of the candidates received a mark between one and four out of ten. Not one in the group obtained the full score. The question is too difficult for the grade; it goes beyond the plan in the Programme of Health Education. This question seeks to test the validity of assumed correlation as between Health Education and General Science. Unit three in the programme of studies has to do with "what to do", not why it is done. In parts (b) and (c), the students have failed to carry over this part of the science.

The first choice of question six, like question five, requires planning and a number of points in the answer. Again, this is different from the usual type of question, and for that reason only 7.8 per cent of the total marks were obtained for this choice. Most of the students were attracted to the second choice of question six, to the circular diagram with the cow's head. This really is a difficult question for Grade IX, even too difficult for Senior High School.

Again the same can be said about question ten; the problem is too advanced for the grade; the mathematics involved are those of High School Physics, not Grade IX General Science. In the first place there are no such problems in our textbooks, and in the second place we have not the time.. We could easily spend a month on the levers and the wheel and axle, which would seriously interfere with the rest of the programme.

The second choice of question seven is a problem in Social Studies and far too advanced for the grade. The causes responsible for Economic Depressions would be difficult to state even by a university student.

In question eleven the 13th and 14th parts are more confusing than difficult. At first sight it looks as though a word is to precede the number and then another word to follow it.

Questions thirteen and fourteen are good examples of the same principle presented in two different ways. The first one is answered quite well, whereas the second one is poorly answered.

In question fourteen the word Microbe is misleading. Most textbooks use the word germ, or bacteria, or micro-organisms. In question thirteen the names are much too difficult for the average student. These could have been listed at the bottom of the problem. The same applies to question fifteen; potential, kinetic, etc., are abstract terms that are much too difficult for the average student to understand.

Part (b) of question seventeen, "The speed of radio waves is about 186,000 miles per second", is abstract and much too advanced for the grade.

The principle of the Electric Circuit in question eighteen is more confusing than difficult. The small circle looks more like a dry cell rather than a Push Button. It is so different from any of the diagrams we have of the Push Button. The diagram of the bell is incomplete. It lacks coils, armature, armature spring and contact points. A number of students spent much of their time in connecting these properly.

Question twenty-two on the Hot-air Furnace is really no problem; everything is done for the pupil, yet most of the rural students failed to give the correct answers. Some were confused with the lettering, others failed to use the proper terms, such as: hot-air register and cold-air register; very few were able to name the convection currents. The reason may be that the rural students are not familiar with this type of heating system; they have coal heaters in every room.

Question twenty-one, the problem on light, is a better example of an object with which city students are familiar. Many of the

city homes have direct and indirect electric lights. In the country, rural districts, electricity is rarely available and consequently rural children are not familiar with this problem.

Question twenty-two might have been a better problem if the students had been asked to draw arrows that demonstrate the air currents, and letter the different parts with names listed below.

The author believes that Question Five, which asks the students to use the Scientific Method in solving a problem, is the best type of question and that a similar one should be given year after year.

Further, the author believes that the course in General Science and Health Education is too long and rigid for any careful study of the topics listed. The five periods a week we have are hardly enough for the theory; this does not leave any time for mathematical problems in science or laboratory experimentation.

It was discovered that most of our textbooks in General Science are written by university graduates for graduates and not for children in Grade VII, VIII and IX. Most of the figures in these books are photographs of either rock formations, that require a geologist to interpret, or of complicated machines which need an expert mechanic to describe their functions.

The common textbook in use for Grade VII and VIII is by George H. Lympus and John W. B. Shore. This book starts out with simple diagrams and comprehensive experiments in Grade VII, but these become few in Grade VIII. The work in astronomy is too advanced for the grade.

The textbooks in Grade IX are worse. The most common one in use is by Charles John Pieper and Wilbur Lee Beauchamp. This book has lost sight of experiments entirely and has few diagrams. It simply has developed into a catalogue of mechanical devices. Most of these are photographs of the most complex machines and are described by specialists to specialists.

The teacher's job, as the author sees it, is to translate this scientific language into simple English, and change the small complex figures into large simple diagrams. It is difficult to understand how a library of such books is going to be of much value to these immature children. We need manuals that instruct pupils how to make simple apparatus and carry out experiments with common things about them. This would increase the efficiency in General Science.

Another thing that the author has noticed about the textbooks is the constant repetition of the material and photographs for the different grades. Our science books are just about as interesting as the old history books used to be, when they were a catalogue of kings and wars with their exact dates, etc. It seems a pity that someone cannot deviate from this traditional way of writing books. Some of these photographs would be interesting if they were accompanied by simple self-explanatory diagrams.

For a number of reasons, the method of teaching as described in the Programme of Studies is difficult to apply. The programme lists these advanced books, then speaks about the rich experiences and the great value that comes to the pupils from enlarged reading and extended research through an attempt to solve problems.

It goes on to say that a single textbook is therefore not conducive to the technique of group discussion and of pupil report for submission to the class. Browsing for data, and skilful selecting and rejecting of information on the ground of pertinence to the problem in hand are techniques of fundamental importance, requiring the multiple textbook procedure. For this reason, it says, every classroom library should contain all the books recommended for use as textbooks and some at least of those listed as reference books for the use of the pupils. We have them all in our school, but we find them of little value unless the pupils have been carefully directed.

The programme speaks of the pupils as though they were university graduates doing research work. Our children are quite small and spend much of their time in play, not in the study of books.

Then the programme goes on to say that the course should not develop into a note-giving course; yet we are responsible for such a mass of material that they do well to memorize the facts. This does not leave much time for experimenting or research work.

Further it is said that the revising committee would discourage the use of manuals, helps, etc., in the hands of the students; that pupils should be encouraged to take inventory of the work accomplished, and set down in sentence form the outstanding fundamental facts deduced from observation, experimentation and reading. The programme continues by saying that well planned

laboratory work, properly organized field trips, the use of library facilities, and open forum discussions are of far greater importance in the presentation of General Science than are lectures and demonstrations by the teacher.

In addition to the book problem, we are sadly in need of laboratory facilities: apparatus, cupboards, tables, etc. Most of our schools still have from forty to fifty seats screwed to the floor. These have a little slanting desk, twenty by fourteen inches, piled with books. Under such conditions it is impossible to carry on any experimental work in the class. Our so-called laboratories in the City of Edmonton are simply lecture rooms, and the time allotted, thirty minutes, is just long enough for a short lecture. Our classes should be half the size for laboratory work. Then in addition to the lecture period, we should have at least a double period for laboratory work. Actual experience in the manipulation of a machine makes it real and leaves a more lasting impression on the mind of the student. The manipulation of machines leads to understanding of the principles involved; otherwise these underlying principles are just so many textbook exercises that are memorized for an examination.



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